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ELECTRICITY.

Vol. XIX. NEW YORK, JULY 11, 1900. No. 1

ELECTRICITY

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EDITORIAL NOTES.

Electricity Must Be Used.

The recent disastrous fire in New York harbor, which destroyed upwards of $6,000,000 worth of property and blotted out over 300 human lives, again calls our attention to the highly inflammable material used in the construction of the wharves and storehouses lining our river fronts, and emphasizes the lack of adequate up-to-date means for fire protection.

Our commercial growth has fast outstripped our antiquated methods of protecting life and property; our pigmy wheeled fire engines have many times proved themselves practically useless to cope with a rapid and serious conflagration.

An original contribution to our columns of Dec. 21, 1898, made this fact plainly apparent as regards the late Home Life Building fire, and the late conflagration on our river front calls our attention to another division of the subject. It was as useless to attempt to quench this horrible fire, with our present facilities as it would have been to prevent a powder mill from blowing up after the powder was ignited. Our great commercial growth requires improved and commensurate facilities for fire protection.

Electricity has been the means to meet the increased demands of lighting and of disinfecting on a large scale; of supplying the demands for power for transportation purposes throughout a large metropolis; of curing diseases and prolonging life, and it will yet be the agent used in preventing conflagrations and subduing them when once under full headway.

The applications of this subtle agent have become so universal that we feel safe in even this prediction, for here, as probably in all other uses, it will find its greatest utility from the ease in which its qualities may be brought into service from far distant points, as well as for its other wonderful quality of being spontaneous in the manifestation of its effects. These two inherent qualities above all others make it better adapted to modern uses, and, speaking in general terms, as being superior to our present comparatively slow and ineffective means of fighting great fires. The Hoboken conflagration presented the lamentable spectacle of a large amount of highly combustible material of great value, closely surrounded on nearly all sides with water, in fact an ocean to draw from, but scarcely an effective drop to be utilized in time, that is, when most needed at the commencement.

There were some small fire engines in electrical communication with the wharves no doubt, but they were in distant localities and could not arrive in time. There were the more powerful fire boats, better capable of dealing with the problem; they were also at distant stations and arrived too late—another case of slow locomotion.

The old idea of transporting heavy instruments over distances that take up precious time, to be used for fighting conflagrations, appears to us as ridiculous, when by quickly turning an electric switch there was to be had enough electric power on tap in Hoboken to have almost washed instantly into the river the burning piers with their contents and superstructures, even if only utilized from the vantage ground of the adjoining piers.

This is why we say that electricity, instantaneous in its operation, capable of transmitting great power effectively over long distances, will eventually be universally used for fighting fires, and will relegate our present almost worthless fire fighting apparatus to the scrap heap.

* * *

New Submarine Boats for the Navy.

After considerable backing and filling it is now definitely decided that the United States Government shall keep abreast of the times, Congress, before adjourning, having authorized Secretary Long to order from inventor Holland five new boats, similar in general detail to the submarine boats Holland and Plunger. This will give the United States a submarine boat flotilla equal in number to that of France, and if reports are to be believed, far superior to the Gustave Zédé type or any other that has been experimented with by our sister Republic. In this connection, says a writer in the Washington "Star," it is worthy of some attention that outside of France, which contemplates adding at an early date twenty-six more vessels of this character to its fleet, no other foreign nation is giving serious attention to submarine navigation. England has never taken the matter up. The Germans made an unsatisfactory experiment some years ago. The Russians commenced one boat but discontinued it. Turkey has two so-called submarine boats, launched

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fourteen years ago. Italy has a little one five years old and Portugal has one dating back to 1892.

As stated in the issue of ELECTRICITY of March 30, 1898, the principal stumbling-block in the way of success which early inventors of submarine boats had to contend with was in finding a suitable motive power wherewith to operate a boat while running on the surface and under water. This problem has been fairly well solved by Mr. Holland by employing two forms of power—gasoline when awash and electricity when submerged. Several new features will be embodied in the new boats which are absent in the Holland. In the first place, the length will be 63¼ feet as against 53 feet, and the width will be 11⅝ feet as compared to 10¼ feet. This increase in the dimensions is much to be desired as it will afford room for a crew of seven men, whereas the Holland could only accommodate five. Furthermore, the surface radius of action, 1,000 miles in the present vessel, will be increased to 1,500 miles. The increase in the size of the vessel and likewise its radius of action, will necessitate a greater propelling power, so that it is proposed to install a new type of alternating gasoline engine for surface propulsion capable of exerting a force of 180 horse power as against the Holland's 50. For submerged runs there will be employed a new improvement in water-proof motors driven by sixty storage batteries located in the bottom of the vessel and serving as ballast. The boats will be illuminated by electricity and will be provided throughout with electric bells for communicating purposes. By means of a new device, whenever one of the crew moves sufficient water to compensate for the disturbance of the vessel's trim will be admitted to or expelled from the proper compartment.

Six months will be required to build each of the five boats, which it is estimated will cost 170,000 apiece. All will not be begun at the same time. They will be finished probably a month or six weeks apart, which will permit of any defects in one being remedied in those of later construction. When completed, if they prove successful on trial, their construction, according to an authority, will probably be continued at the rate of five or six a year, and thus all improvements suggested by the continuous series of experiments will be gradually embodied in the little vessels as fast as they are launched.

* * *

Electricity As a Fire Hazard. A report has recently been handed in by the Committee on Lighting and Heating of the National Board of Fire Underwriters which has attracted considerable attention. The committee points out that the electrical bureau of the Board had listed up to April 10, 1900, 2,650 fires of electrical origin, and quotes the Chronicle Fire Tables, showing 3,022 fires, involving a loss of $32,510,-558, during the past ten years. "We think it likely," says the "Insurance Advocate," commenting on the subject, "that the record of electrical fires is very imperfect owing to the fact that electric wires are mostly cut of sight, under floors and between walls, so that more often than not it is impossible to trace the origin of the fire to a certainty."

That electricity is responsible for very many fires there is not the slightest doubt, due to various causes, such as poor workmanship, inadequate inspection, etc. On the other hand we think that very frequently a conflagration is attributed to a defective system of wiring, when in reality some other cause should be sought for. However this may be, there is no denying the fact that there are more fires of electrical origin than there should be or would be were rules of the National Board of Fire Underwriters more universally heeded. As our above mentioned contemporary states, last year the National Board directed its Executive Committee to appoint a special committee to confer with representatives of the union, S. E. T. A., and other bodies, with a view to placing all tests of electrical devices in charge of the Board. The special committee evolved a plan for the establishment of a board of consulting engineers, to be appointed by the Executive Committee, and to consist of representatives of the leading tariff associations and local boards. The National Board itself is represented on this board of engineers, the Executive Committee having engaged Mr. G. E. Bruen, of New York, for the work. The tests will be made, so far as possible, in Chicago.

Mr. Bruen, says the "Insurance Advocate," has visited a number of the leading cities of Texas and found there conditions that seem to call for immediate action. Similar conditions exist in other parts of the country. A form of permit is proposed requiring all installations to be made and maintained in compliance with the current edition of the National Electrical Code. The committee has sent a blank to cities of 20,000 population and over to ascertain whether ordinances are in force governing electrical installations, and whether, if any exist, they are based on the National Electrical Code.

Many cities have responded satisfactorily to these inquiries, but a large number have not, and until every municipality provides for a vigorous inspection wherever electricity is used in any form there is bound to be poor and hasty workmanship, which may ultimately occasion a heavy loss by fire. That competent municipal inspection is much needed we have frequently stated in these columns, and is forcibly illustrated in the fact shown by statistics that the principal losses by fire through defective electrical installations have been in localities where no suitable ordinance relating to the supervision of electrical hazards has been in force.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

ONE by one the difficulties and objections attending the use of wireless telegraphy are being surmounted. Thoughtful and patient inventors may yet make this new system of communication realize all that was claimed for it originally. It is a well known fact that our great inventions with few, if any exceptions, owe their utility to improvements by many minds. Bell telephone stock that went begging for ten cents a share was made highly valuable by the Blake transmitter and other improvements. The delicate siphon recorder gave to submarine telegraphy the required means to make this a grand uniting bond between the widely separated nations of the earth. The progress in wireless telegraphy is obeying the same general rule. One of the often quoted objections to this method has been the ease with which its messages could be read by those for whom they were not intended. Our present issue contains a translation from our esteemed French contemporary, "La Vie Scientifique," of an interesting improvement in this direction by D. Tommasi, that appears to promise a simple solution, especially as barring out interlopers, with receiving apparatus at intermediate points. Mr. Tommasi's invention is clearly explained in this article and it is well worthy of attention.

MANUFACTURERS of electrical supplies are endeavoring to obtain a revision of the railroad freight classification, which rates all of their products as first-class freight and some articles as double first-class. A suit in the United States Court is threatened to enforce the Interstate Commerce law provision against discrimination. Complaint is made that the electrical supply industry is seriously hampered because the railroads charge the highest rates for carrying electrical goods. It is alleged that first-class rates are charged on a number of articles when shipped as electrical supplies, when the same articles are carried as third-class frieght when used for other purposes.

THE following cable dispatch from London was deemed worthy of a "spread-head" in the N. Y. "World:" "Experiments in growing potatoes by electricity have been undertaken by the Irish Agricultural Board. Father Glynn, of Athea, Limerick, in charge of the experiments, studded a potato patch with lightning conductors connected by wires running through the patch. The result was an increase of 80 per cent. in the yield in the section so treated. Should the official experiments bear out this experience a solvent for the chronic distress in the west of Ireland will have been found. Horace Plunkett, M. P., Vice-President of the Agricultural Board, says: "This most remarkable phenomenon may be the forerunner of a revolution in agriculture. The evidence furnished and the genuineness of Father Glynn's experiment are incontrovertible."

ELECTRICITY as a means for the ending of the lives of the dogs which may fall into the hands of the official dog catcher is being talked of in Columbus, O. City Electrician John Morris suggests that a kennel be arranged with a flooring of copper strips of opposite polarization and that the dogs be driven in it, the wires connected with these copper strips and the current turned on—then dead dog. In this way as many dogs as the pen could contain would be killed together.

SEVENTEEN automatic telephones are now in use in various places in Melbourne, Australia, and suburbs, and their introduction has proved a financial success. The machines at two railway stations have so far returned at the rate of between £20 and £25 per year. So satisfied is the Melbourne Postal Department with this experiment, that arrangements are being made to raise the number of instruments to 50.

A NEW use for the graphophone has been found in New South Wales, where a candidate who found it impossible to visit all parts of the sparsely settled region he wished to represent in the Legislature, dictated his speech into an instrument and sent a number of copies about for his constituentsto hear, and a large picture of himself helping the voters to know who they were voting for.

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THE inventory of the personal estate of the late Garret A. Hobart was filed with the surrogate at Paterson, N. J., Monday. It appraises the late Vice-President's wealth at $2,628,941. Mr. Hobart held bonds in about twenty-six corporations (among which were a number of electrical companies), and stock in more than one hundred other concerns.

MR. W. W. SKILES, president of the Shelby Electrical Company, Shelby, Ohio., has received the nomination for Member of Congress of the Fourteenth District of Ohio. His election is predicted by a large majority.

UPWARDS of $60,000 is to be spent in the modern equipment of the Nagoyo (Japan) Electric Light Company. The company proposes to begin operations by using 5,000 lights and in the near future its capacity is to be increased.

THE Post-Office authorities of London are preparing to lay pneumatic tubes for the delivery of letters similar to those used in New York. There are already thirty-four miles of pneumatic tubes working there, but these are only six inches in diameter and are found to be inadequate. The American tubes will be from twelve to sixteen inches in diameter. At present it takes longer to get a letter from one end of London to the other than it does from Manchester to London.

THE street railways of Havana are to change the motive power from horses to electricity. The city is in great need of rapid transit.

THE St. Louis Transit Company is augmenting its force of employes and its transportation facilities to such an extent that all semblance of a strike promises to disappear in the near future.

THE policemen at Asbury Park, N. J., have been provided with electric pocket lights, which they use to discourage young couples from the practice of being too affectionate on the beach after sundown. The founder of the park is very strict in enforcing the observance of all the proprieties, and so officers of the law will flash their tiny electric illuminators wherever a suspicion of beach love-making exists.

IT is stated that a famine of gutta-percha, says the N. Y. "Sun," is threatened through several causes, and no greater calamity could overtake the cable companies. No other substance is comparable with this gum for the insulation of cables; indeed, long distance cables cannot be made with any other insulation hitherto discovered. The causes of its scarcity are several. It grows only in a limited area, principally in the Malay peninsula, Borneo, Java and the adjacent islands. The tree is of very slow growth, requiring thirty years to reach maturity. The gum is gathered by the natives, who have used most wasteful methods, generally resulting in the destruction of the tree. Now that the gum is valued at more than $1.50 a pound the incentive to dishonesty is too great for the Malay character, and much of the gutta-percha coming into the market is so adulterated as to be worthless. Singularly enough, the popularity of golf has had much to do with the extinction of the gutta tree. Golf balls are made of gutta-percha and enough is used for their manufacture every year to insulate a transatlantic cable. The increase of demand on this account and consequent increase of the value of the gum have stimulated the native gatherers to wholesale destruction of the gutta forests, their favorite method of saving time and labor in collecting gutta being to cut down the tree. If the Pacific cable is to be built at once, it is doubtful if there is enough gutta-percha in the world to make it. Here, then, is where necessity must again bring forth invention, for a substitute for the gum is urgently needed. Meanwhile, the Philippine Islands, especially the southern ones, have the proper soil and climate for the gutta-percha tree, and the United States Government has an admirable opportunity to foster the growth of a highly valuable product there.

A PECULIAR but very serious difficulty besets the operation of telegraph lines in the Argentine Republic. The small spider, of the variety that spins a long cobweb and floats on it in the air is so plentiful there that the floating webs settle on the wires in enormous quantities. As soon as dew falls or a shower of rain comes up, every microscopic thread becomes wet and establishes a minute leak. The effect of thousands and millions of such leaks is practically to stop the operation of the lines, and the Government telegraph department, especially in Buenos Ayres, has been put to vast inconvenience by the cobwebs. A number of expedients have been tried but to no avail. On the important line between Buenos Ayres and Rosario the effect of the spider webs is to cut down the speed of working from 300 or 400 to 30 messages an honr. The Government has just determined, as a last resort, to connect the two points by an underground cable about one hundred and fifty miles long.

THE cable steamship Silvertown, a British vessel belonging to the Telegraph Construction & Maintenance Company of London, left her anchorage in the upper bay Monday to begin the work of laying the Commercial Cable Company's new cable between Coney Island and Fox Bay, Canso, N.S. The cable is to make connection at that point with the cable which the Faraday recently laid to the Azores. Manager Director R. K. Gray, who arrived on the Oceanic last Wednesday, is on board the Silvertown, and will remain there until the 950 knots of cable have been placed.

IN weaving with the complicated Jacquard loom a great improvement has been introduced, consisting of manipulating the hooks controlling the various threads by electricity. The Jacquard loom is used in weaving colored or embroided figures on silks, etc., and is able to produce very complex patterns. Hitherto the hooks have been controlled by cards, punched with holes corresponding to the desired appearances of the warp threads. In the new method the patterns are drawn directly on metallic sheets, or they may be photographed on them from the designer's drawing. Electrical contact points passing over the design strike the insulating ink in which it is drawn and breaking contact at the appropriate instants, control the motion of the web through electromagnets. Both the simplicity and speed of Jacquard weaving is increased in this way. At Glasgow, Scotland, a large new factory has been started to use this method, and it is thought that it will also be applied to carpet looms.

LONDON NOTES.

[From our London Correspondent.]

The Mnnicipal Electrical Association.

This year's annual convention of this Association, opening on June 20, was under the presidency of Mr. A. B. Mountain, the borough electrical engineer of Huddersfield at which city the meetings were held. The proceedings concluded with the usual business meeting on June 23.

After the delivery of the presidential address, in the course of which Mr. Mountain covered many topics, technical and administrative, engineering and financial, in connection with the conduct of municipal electric lighting and tramway undertakings, papers were read as follows:

Alderman W. Potter, of Taunton, and Mr. H. C. Bishop of Wigan, on "Means for Stimulating the Demand for Electricity."

Mr. C. S. Vesey Brown on "Electricity Supply for Small Towns."

Mr. G. M. Harris on "The Lighting of Small Towns."

Mr. T. P. Wilmshurst on "Power Supply by Single-Phase Motors."

Mr. C. A. L. Prussman on "Notes on the Maintenance of Motors on Hire from an Electricity Works."

Mr. R. C. Quin on "Combined Management of Tramway and Lighting Departments."

Mr. H. L. P. Boot on "Methods of Reducing Light Load Losses."

Mr. L. Andrews on "The Distribution of Electricity to Scattered Areas."

M. G. Wilkinson on "Distribution of Electricity."

Mr. C. H. Wordingham on "The Maintenance of Certain Portions of Distributing Systems at Earth Potential."

Mr. A. E. LeRossignol of Newcastle on "Impressions of Present American Tramway Practice."

Mr. R. C. Quin of Blackpool on "Protection of Telegraph and Telephone Wires."

The, customary luncheons and visits to electrical works in the neighborhood of Huddersfield and Leeds formed part of the proceedings.

The Central London Railway.

London's third deep-level electric line was publicly inaugurated June 27. His Royal Highness the Prince of Wales performed the ceremony. Third rail, twin tunnels, 13½ miles of 4 feet 8½ inches track, generation at 5,000 volts three phase at Shepherd's Bush station, transformed to 500 volts line current. There are four sub-stations at suitable points. Thirty-two locomotives and 170 carriages (seven per train) comprise the rolling stock. In the power station there are 16 Babcock water-tube boilers 6 Reynolds Corliss horizontal compound condensing engines, and six three-phase alternators of 5,100 kw. total capacity. Sprague electric lifts are to be employed at the several stations between the city and Shepherd's Bush.

Professor Lodge.

Dr. Oliver Lodge, F. R. S., who has for some years been principal of the University College, Liverpool, has now been appointed by the Board of Education to the principalship of the Birmingham University.

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ELECTRICALLY OPERATED RAILWAY TURNTABLE.

BY FRANK C. PERKINS.

The ease with which steam operated railway turntables may be converted into electric turntables may be seen from the accompanying illustrations. There is no question but that electric power has every advantage as steam for this purpose, as small portable engines and boilers are far from economical and require more constant attention. The electric turntables may be equipped with either alternating or direct current motors and are easily supplied with current from either the lighting or power circuits from the power house. The turntable is easily manipulated from the small building shown in Fig. 1, and the simplicity and ease with which its operations may be manipulated make it far superior to the steam operated turntable. The illustrations, Figs. 2 and 3, show the Westinghouse turntable "donkey" which consists of a 10 hp. series reversible motor and is mounted upon a heavy cast-iron frame which moves in the turntable pit. The entire motive power weighing less than two tons. The electric turntable when loaded with a ton wheel locomotive weighing 200,000 lbs. makes a complete revolution in about ½ minute. It is claimed by the manufacturers that there is an enormous saving in using the electric round house table over those operated by push poles or even portable steam engines and boilers.

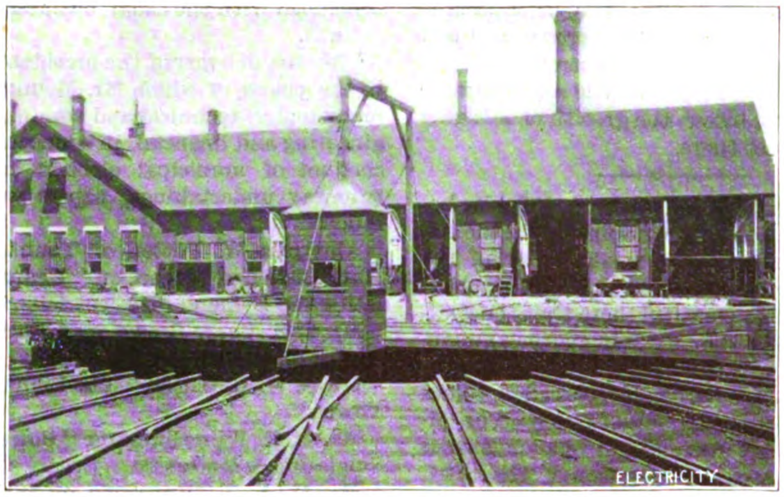

Fig. 1.—An Electrically-Operated Turntable.

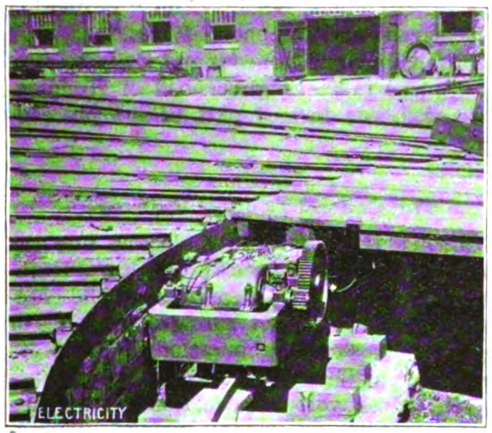

Fig. 2.—Dust-Proof Turntable Motor.

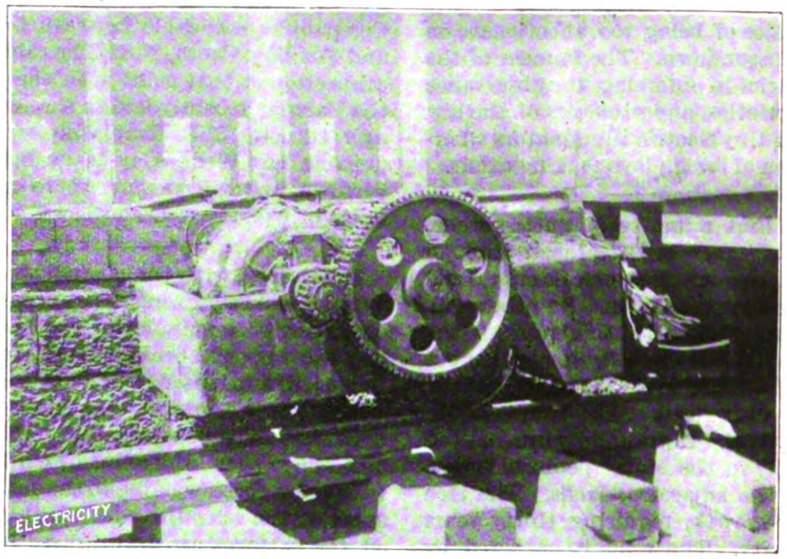

Fig. 3.—Electric Turntable Motor.

The Washington monument is hereafter to be operated by electricity. It costs the Government at present about $20,000 a year to take the public up the 500 feet to the top and down again.

HOT-WATER HEATING FROM A CENTRAL STATION.*

BY H. T. YARYAN.

It does not require the eye of a prophet to foresee the future means of heating and lighting our cities. If heat, using water as a vehicle, can be distributed from a central station covering a territory measured by a radius of 1½ miles from the station, and do it with profit to the investors and entire satisfaction to the consumers, the problem would seem to have been solved. This has been done by the Toledo Heating and Lighting Company for the past 5 years a period sufficiently long enough to place the enterprise beyond the experimental stage, and entitles it to be classed as a successful business venture. It is because I believe the members of this society will in the future be called upon to exercise their skill and knowledge in refining and perfecting the system that I lay the facts and "state of the art" before you, giving freely results of my own experience, in the hope that it will be of assistance when you are called upon for advice.

I think that it will be found that when the new system is generally introduced in connection with the production of electricity, you will be forced to modify your views on high-pressure steam and the compounding of engines. Where steam economies are of little avail seven months out of the twelve, and where seven months cover four-fifths of the electrical output for the year, there would seem to be little encouragement for heavy outlay in that direction. Fortunately for the system the demands for heat and electricity run almost on parallel lines a large portion of the year. Under the new system electricity becomes a by-product, the only cost of fuel being the condensation of engines, which will average probably 20 per cent. Experience has shown that for every dwelling house heated it requires the exhaust from engines necessary to light four. It therefore follows that the lighting district must be extended beyond the heating, or some other use be found for the output, such as street railroads, if the entire city is to be heated. If some great genius, like an Edison or a Tesla, were to announce to this society that electricity could be produced without cost, I imagine there would be a sensation; and yet the Toledo Heating and Lighting Company is doing this very thing, as the six months' business ending January 1, last, shows, the load being 199 houses heated and 450 lighted:

Receipts from heating		$9,900.88
Receipts from lighting		9,064.78
Fuel	$5,040.63	
Wages and salary	2,827.14	
Expenses—taxes, repairs, oil waste, etc.	1,896.77	
	$9,764.54	

I presume the question will be asked why electricity should be treated as a by-product instead of the heat. My answer is that charges for heat can be fixed and maintained, the consumption of coal increasing proportionately with the number of consumers while the opposite is true of electricity, and a flexible scale of charges is necessary if the large excess of output is to be disposed of.

Most of you will recollect the disastrous failure in Boston about 12 years ago, in an attempt to distribute hot water from a central station. A large sum was invested, and the work of installation was of the highest order. I have no direct information as to the causes of this failure, but it is not hard to figure out if one reads the paper of Chief Engineer Abbot before the Boston Society of Civil Engineers. The two mains laid were 4 inches for outflow of hot water and 6 inches for return. The proposition was to heat water to a temperature of 400 degrees F., and to circulate, necessarily, under a pressure of 250 pounds. He says, in his paper, that the maximum rate of circula-

* Paper read before the American Society of Mechanical Engineers, Cincinnati, May, 1900.

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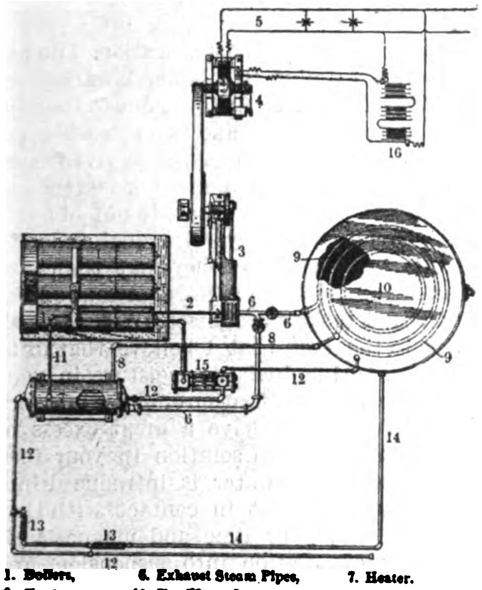
tion would be from 10 to 15 feet per second. If I can figure friction, and making a liberal allowance for the less viscosity of hot-water, there would be lost in pressure from 3½ to 8 pounds per 100 feet, or at the end of a pipe 3,000 feet from station, from 100 to 240 pounds. The effect of this on superheated water would be to convert a large portion of it into steam, and the small service pipes, of ½ to ¾-inch, to the various houses would not deliver a sufficiency of the mixed steam and water to heat the buildings. Other troubles would follow in the return pipe. The theory was that when the pressure was reduced inside the buildings, the superheated water would give up a large percentage of steam, and this was to be used for heating; the water returning to the station by gravity, in a closed circuit, to be again superheated. Unfortunately superheated water will give up its steam inversely as the pressure, and as the pressure must be greater at the extreme end of the line than at the station, it follows that as the return flow reaches points of lower pressure, steam will again be formed until the pumps reach their capacity for handling the mixed volume of steam and water, when circulation would slow down and practically cease. There are many other troubles which they must have encountered that I could mention, but the one given is sufficient, as it was inherent and fatal to the working of such a system. The surprise is, not that the experiment was a failure, but that intelligent engineers should have given their sanction to such an undertaking.



1. Boilers, 6. Exhaust Steam Pipes, 7. Heater.
2. Engine, 10. Hot Water Storage, 9. Heating Coil
4. Dynamo, 15. Circulating Pump, 16. Storage Battery.

FIG. 1.—PLAN OF HOT-WATER HEATING SYSTEM.

The system I am about to describe and show in plan (Fig. 1) is so simple that but few words are necessary to make it intelligible. The steam boilers, engines and dynamos are such as may be used in the ordinary electric light station. Heaters of the tubular type through which the water passes from the pumps to the mains receive the exhaust steam from the engines, heating the water to any desired temperature. When more exhaust is being produced than is required to heat the water, the excess is delivered to a water storage tank to be used later when the output of electricity is small. The circulating system consists of two wrought-iron pipes, laid side by side in the ground, carefully protected by insulation, one pipe for the outflow of hot water impelled by the pumps, the other for the return water from the coils in the various houses heated, going back to the suction end of the pumps, to be forced again through the heaters, where the loss of temperature is restored.

The Toledo Heating and Lighting Company has two stations, known as the Floyd street and Twenty-second street stations, and although the heating mains of the two stations are separate and distinct, the dynamos of the two stations feed into a common system of electric mains. The length of the double water mains, that is, ditch, connected to the Floyd street station is 8,550 feet, and the number of houses heated is 101. The length of mains from Twenty-second street station is 8,260 feet, and the number of houses heated is 98. The amount of radiating surface connected with the Floyd street station is about 9,000 square feet, and with the Twenty-second street station about 85,000 square feet.

The amount of coal consumed at both stations during the heating season, from October 1 to May 1, averages 5,000 short tons of coarse slack, or about 25 tons to the residence. These same buildings, if heated by their own furnaces, would average not more than 18 tons of hard coal each. The difference may be accounted for by the loss of heat in ground radiation, and largely by the fact that we heat the buildings more thoroughly and for a greater number of hours than they could or would do by private furnaces. The loss of heat through radiation in our mains is an important one, and I am sorry not to be able to give positive data, and it is impossible to more than approximate the loss. From careful observation I estimate the loss to be between 15 and 20 per cent. The water reaches the extreme end of our lines, three-quarters of a mile from the station, in the coldest weather, with a loss of 12 degrees F., which would be an average of 6 degrees to all of the houses. As the water returns to the station with a drop of 35 degrees, this would indicate about 17 per cent. loss in the ground, which I believe to be nearly correct. A pressure of 60 pounds is maintained on the feed line during cold weather and 40 pounds during moderate weather. The service pipes to the various houses are 1-inch pipe, and the return line throttled with a disk inside the building, the size of opening depending upon the quantity of radiation, but averaging ¾ inch. The houses are equipped with radiation sufficient to heat them to a temperature of 70 degrees F., with water entering the house at 160 degrees F., when the outside temperature is freezing. By raising or lowering the temperature of water 1 degree for each degree of variation in the outside temperature we are able to maintain a constant temperature in the houses during all kinds of weather. There is no occasion for the consumer to regulate the flow of water during the entire winter, and with few exceptions, our consumers open the supply valves in the fall and only close them in the spring. The extreme limits of temperature of water are from 130 degrees in moderate weather to 212 degrees in the coldest.

The insulation used is shown in section (Fig. 2), and is both effective and inexpensive. The top, bottom and sides are made in separate sections by using for top and bottom three 1-inch boards, separated with ¼-inch strips to form air spaces, with 1-inch by 4-inch boards on the sides to prevent the entrance of earth. This manner of insulation is as nearly perfect as can be hoped for, and the only improvement which might be suggested is to creosote the outside boards. After four years of use the only sign of rotting is in the outside boards which come in contact with the earth. The heat in the mains keeps all other boards perfectly dry, and it would seem that their life was indefinite. The mains are laid in a ditch only 30 inches deep, as we have found by experience that the nearer they are to the surface of ground the less the loss by radiation. The reason for this is simple enough, as wet ground is a better conductor of heat than dry, and the deeper you go the longer the ground remains wet.

The heaters are really surface condensers, and I have some hundreds in use for this purpose, the only novelty about them being the manner of providing for the difference in expansion of copper tubes and iron shell. No thimbles or other devices are used to permit a slip through flue sheets, but each tube is rigidly expanded in the top and bottom flue sheet.

They are 7 feet long, 24 inches in diameter and contain 500 ⅝-inch copper tubes. The tube, before entering, is bent so as to make a permanent sag of ⅛-inch, which is intensified to about ¾-inch in expanding, by the use of a drift.

As all the water of condensation is sent back to the boilers, a thorough separation of oil is necessary. I have found most of the so-called traps a delusion, as they depend upon slowing down the steam current to permit the particles of oil to be dropped. The finer particles, however, are so thoroughly entrained that they are carried to the condensers and thence to the boilers. The trap was really constructed to separate entrained salt water, in distillers on ship boilers under a vacuum, where the speed of vapor is high. The principle involves separating the volume of vapor into jets by passing through 1-inch tubes equal in area to the exhaust pipe, so that only a narrow space intervenes between the end of the tube and impinging surface. The smallest particle of entrained substance is carried over this space by its own momentum and is held by the impinging surface, where it runs off through the drain pipe. Incidentally I may state that fully one-half of the oil used on engines and pumps is recovered and used over again.

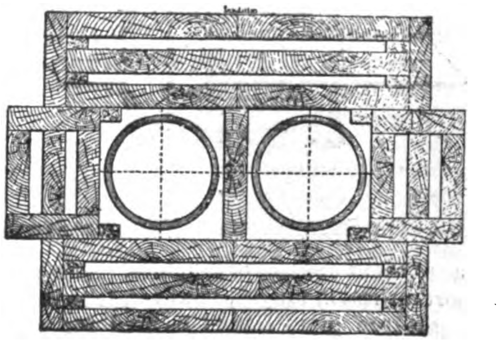


FIG. 2.—SECTION OF PIPE INSULATION.

The provision for expansion on underground mains is of vital importance. After trying all manner of devices the ordinary U, where the run is straight, and 90-degree bends at corners, answers the purpose admirably and gives no trouble whatever. The U's are placed about 600 feet apart, and as the extreme expansion is about ¾-inch to 100 feet, only 4½ inches are necessary to be taken care of by each U. As the mains are laid cold we put an extra strain when laying on the U's in an opposite direction

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to that in which they work when allowing for expansion.

Almost the first question asked by a practical engineer is, how about the corrosion of your pipes? I am happy to say that I can answer this question in a satisfactory manner, as over 10,000 feet of pipe were relaid last summer after being in use five years. The wrought-iron pipe showed no signs whatever of corrosion, but steel pipe was perceptibly affected. There was a great difference in different lengths of steel pipe, but all was affected more or less. The appearance of the pipe showed the forms of nodules on the inside, varying in number from one dozen to 100 in a length of pipe, and in size from a grain of corn to a hazel nut. When the nodules were removed a soft under-layer of carbon remained, and with the finger-nail this could be removed, developing a perfectly round pit from $\frac{1}{4}$ to $\frac{3}{16}$-inch deep, but in no instance had the pit perforated the pipe. As a matter of curiosity, some steel pipe which had been in use two years was examined and found to be in exactly the same condition as that of five year's use. The action seems to be electrolytic, some particle of impurity forming the nucleus for decomposition of the steel. If any inference can be drawn from the facts stated, it is that the impurity has lost its power to cause electrolysis after being surrounded

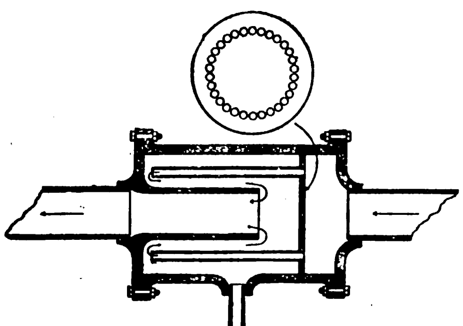

FIG. 3.—OIL SEPARATOR FOR EXHAUST STEAM.

by a sufficient amount of graphite. The most important lesson taught, however, is that only wrought-iron pipes should be used for water circulation.

A test with pressure gauge on the outflow pipe at the extreme end of our lines shows 39 pounds with 60 pounds at the station, or a loss of 21 pounds due to friction. At the same time the pressure on the return line was 28 pounds, and as the friction should be the same on both lines, the difference may be accounted for by the fact that the return line discharges into a tank 15 feet high at the station.

In calculating the size of mains for a given number of houses it became necessary to know the relative friction of hot water as compared with cold. To my surprise I was unable to find any data that were of value, and to settle the question I made some tests which may be useful in future work. A run of 450 feet of 1-inch wrought-iron pipe with numerous bends was connected to a heater, and the water passed through a meter. With a constant pressure of 10 pounds the following cubic feet of water were delivered at the open end of the line in 5 minutes:

At 34	degrees	F.	6.2
" 60	"	"	6.3
" 90	"	"	6.4
" 120	"	"	6.5
" 150	"	"	6.6
" 185	"	"	6.75
" 212	"	"	7.9

As it requires an average of 15 gallons per minute to be delivered at each house, and knowing the friction of cold water, the data thus obtained enabled me to calculate the size of mains necessary to give good service to each house and to always maintain a sufficient difference in pressure between feed and return mains to insure rapid circulation.

As exhaust steam heating from central stations has been introduced to a limited extent, it may not be out of place to call attention to the objections to steam, which do not apply to hot water.

1. The exhaust not being uniform in power plants throughout the entire period of 24 hours, either live steam must be used during the minimum load or exhaust must be lost during the maximum load.

2. The excessive cost of laying steam mains, which must be large and thoroughly protected from infiltration of water. The temperature of pipes being above the boiling point of water, any infiltration is converted into steam, and thus a vast amount of heat is dissipated.

3. It is absolutely necessary that from 5 to 15 pounds back pressure shall be carried on the engine, which is exceedingly wasteful.

4. The condensation of steam is wasted and with it a large percentage of heat.

5. The piping of houses is expensive on account of the large size required to convey steam with 1 or 2 pounds back pressure.

6. The service is not satisfactory on account of difficulty in regulation, especially in mild weather.

7. The offensive smell due to vents and leaky stuffing boxes.

8. Water hammer due to condensation in house pipes.

9. The quality of heat, especially where direct radiation is used.

10. Danger from fire, which has been abundantly demonstrated, can rise from long continued contact of steam pipes with wood in an enclosed place.

11. Greater loss by radiation in ground, due to an average higher temperature of mains.

12. The necessity for sewer connections to remove condensation in mains where traps may form.

13. The rapid destruction of all iron drips, due to the solvent action of distilled water.

14. The filling of the entire system with air when a shut-down occurs for any length of time.

The only counter-charge I have ever heard made was that it required live steam to run the pumps. But this is largely offset by the back pressure on engines in the steam system, and can be made a large source of profit by selling the heat, as none is wasted.

During the past two years the system I have described has been installed and is now in successful operation in the following cities and towns: La Porte, Ind.; Mattoon, Ill.; La Crosse, Wis.; Kenosha, Wis.; Alton, Ill.; Portage, Wis.; Boone, Perry, Ida Grove, Iowa Falls and Mason City, Ia.

During the present summer the company which I represent will install a refrigerating plant for domestic use, distributing cold brine in exactly the same manner that we do hot water, but using a separate set of mains. We shall use an ammonia absorption machine, operated with exhaust steam so that as the demand for heat ceases that for cooling purposes begins, thus utilizing the exhaust steam from our engines during the summer months, which now goes to waste.

WET STEAM.*

BY WILLIAM H. EDGAR.

I am here at the request of your worthy Secretary, and I really did not know what to take as a subject, and in an off-hand manner I gave him the title "Wet Steam." Now wet steam, of course, you are more familiar with than I am. It is produced from two different causes in the boiler, one is priming and the other foaming. Priming I have nothing to do with that comes under mechanical defects and belongs to the engineering profession. Priming is due, as you well know, to the lack of delivery surface or lack of steam space and to the mechanical construction of the steam dome, and especially the connections between the different domes in water tube boilers. But wherever such a mechanical defect might exist, the water you might say would spatter the steam if your boiler water contained salts of soda.

Foaming is caused by saponification. I do not believe that foaming in a boiler is caused by mud or dirty water. I think it is due to the soda contained in the water, and as a rule wherever you have a river, that is to say, using river water containing mud, you have more or less soda in the form not only of a carbonate but of a sulphate. You are probably well acquainted with well waters and the tendency that they have to foam after running a week or two; and the reason that I took as a subject "Wet Steam" was due to the fact that I believe that in 90 cases out of a hundred the moisture in your steam is due to saponification or to the presence of soda. You might have a great excess of lime and magnesia in solution in your feed water, but when the water is introduced into the boiler and brought in contact with that degree of heat, your lime and magnesia is thrown out of solution into suspension, and consequently you get no action whatever in the way of foaming. It does not increase the density of the water. It is not a part of the water. It is not in solution. Soda always remains in solution. Ninty per cent of the waters throughout the country used in the boilers contain considerable lime and also some soda, and nine plants out of ten are treated in one way or another with some one or the other salts of soda, and you get the same action in all such cases that you receive from the use of artesian well water and suface well water in certain places where the soil contains sulphate of soda and generally the carbonates.

Now what I wanted to refer to was the fact that you all know that it is essential to get as dry steam as possible, and if you could get absolutely dry steam, you could use a straight mineral cylinder oil without requiring the admixture of any animal oil whatever. The animal oil is necessary only to take care of the water. The condensation washes off the mineral oil, necessitating the compounding with an animal oil to hold it, to give it the clinging, adhesive, film-cutting properties of a good cylinder oil.

On the Burlington road they condemned the oil and sent it back repeatedly month after month just during the last couple of years—in fact the last year—and could not buy anywhere else except of one company, and they had considerable difficulty in getting an oil to meet their requirements. They finally reached about 35 per cent. of tallow in the compounding

*Paper read at the Northwestern Electrical Association Convention, Waupaca, Wis., June 26-28, 1900.

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They were using soda ash in the boilers, and the more soda ash they used the more moisture they had in their steam, the more they saponified the water and the more moisture was carried over and with this moisture came soda, and the more soda that came over the more it cut the animal oil, saponifying it, forming soap, and they had considerable difficulty before they found out really where the trouble lay.

I believe that throughout the country in different plants a great many good cylinder oils have been repeatedly condemned and all due to the well water used carrying the water a little too high in the boiler, or using some preparation of soda, and of course the higher you carried the water, and the more you agitated the water from a sudden opening, I suppose, of the valve in the delivery of steam, the more readily it would foam, and I believe that in all your practice in the engine room, that if you would watch your water level and the nature of your water, so as to know the amount of soda it might contain, it would enable you to better take care of the oil question.

Caustic soda in a saturated solution would contain 59 per cent. of caustic soda; a saturated solution of soda ash would contain 40 per cent. soda ash, when it would begin to cake; with salt you would have a 35½ per cent. saturated solution before it would cake. All sodium salts remain in solution until the solution is saturated, and then they cake and always cake at the hottest part of the boilers. It is quite common in Kansas and down in New Orleans and out in the Hawaiian Islands and along the seacoast where they use salty water to buckle the tubes and bag their sheets, due to salt.

So I brought this question up and state that I believe that nine-tenths of the wet steam and cases of foaming are due to soda.

DISCUSSION.

Mr. McMaster—What is the best easily applied test to determine whether there is an excess of soda or not?

Mr. Edgar—An analysis of your feed water is about the only course you can pursue. You can have that done at any State university. If you were running a condensing plant on the seacoast, using salt water and had trouble in your boilers, you would look for leaky condensers. I found out in San Francisco that they were testing by taste. They let it go until they could taste the salt. I rigged up an apparatus where they could titrate and determine the salt. Their natural supply showed about four grains of salt to the gallon. When they found it to run six, eight or ten per cent. they looked for a leaky condenser.

Mr. Copeland—Wouldn't the easiest way to find this be to examine the inside of your boiler when you clean it? If there is considerable scale, you have considerable soda, haven't you? And if there is no salt you haven't any.

Mr. Edgar—No, the scale would really give you no indication of the amount of soda.

Mr. Copeland—All that we purge a boiler for is to do away with the scale, isn't it? If your flues do not scale, you are about as near perfect as you can be, are you not?

Mr. Edgar—Oh, yes, but I was referring not to the purgers, but to the natural conditions from the use of well waters.

Mr. Copeland—Wouldn't that be a good way to find out whether you have good water or not, that is, for us country fellows that do not know anything about the technical practice of the thing?

Mr. Edgar—Oh, yes, if you are not getting into trouble and have dry steam.

Mr. Copeland—It is pretty hard to get dry steam.

Mr. Edgar—Yes.

Mr. Copeland—I have a separator in my main steam pipe, and the amount of water that comes out of it is astonishing. What makes the condensation I don't know, but it will empty several gallons every 10 or 15 minutes.

Mr. Edgar—A great deal of that depends upon the boiler and its construction. Take the large horse-power units to-day in use in water tube boilers, and when you are running up to full capacity, your steam is practically in your fire, and when you draw on that boiler suddenly, there must necessarily be quite an agitation, and you have a very small delivery surface, and in some of the water tube boilers I would say, although I am not an engineer, that some of the connections are decidedly wrong.

Mr. William H. Schott of Chicago—Is it not a fact that this is usually caused by carrying the water too high?

Mr. Edgar—Yes.

Mr. Schott—In ninety per cent. of the cases?

Mr. Edgar—Yes, sir. It is a fault of firemen throughout the country to carry the water too high. In a Sterling boiler you ought to carry the water as low as possible on account of the back drum and steam delivery.

Mr. Copeland—How much water would you carry on top of your tubes in a horizontal boiler?

Mr. Schott—Three inches on the front end; and if the boiler is set properly, it should be about one inch or an inch and a half lower in the back end.

Mr. Edgar—What water have you been using?

Mr. Schott—Michigan Lake.

Mr. Edgar—That is an exceptionally good water.

Mr. Schott—Yes, sir, it will average about 20 grains to the gallon.

Mr. Edgar—Lake Michigan is a lime water and a lime water will not foam.

Mr. Copeland—We use lime water out of the river but it gets to foaming once in a while.

Mr. Edgar—It will show up some soda too.

Mr. Schott—If you use soda ash as a purgent you will get violent foaming.

Mr. Edgar—I wish to say in addition to what I touched upon that oil coming back in the return condensation and causing considerable trouble, making the flues leak, buckling a tube or bagging a sheet, is quite common in the condensing plants of to-day.

Mr. Copeland—How will you get oil back in there?

Mr. Edgar—In your return condensation. They have tried it in a great many cases, and there are cases where they use all their condensation back in the boilers.

Mr. Schott—To what kind of condensers are you referring?

Mr. Edgar—I am referring to a condensing plant where they turn all their condensation back into the feed water supply.

Mr. Schott—That can be done with a Wheeler surface condenser.

Mr. Copeland—I use a jet condenser.

Mr. Edgar—They have a great many times introduced soda ash and caustic soda with the object of cutting the oil, and have saponified it. In the first place they had an insoluble soap as a result of the action of the olic acid, forming oxide of lime, and they have used soda to cut that, and it forms a soluble soap which saponifies the water, causing violent foaming.

WIRELESS TELEGRAPHY APPARATUS TO PREVENT THE INTERCEPTION OF MESSAGES.*

BY D. TOMMASI.

It is well known that wireless telegraphy is inconvenient on account of the publicity of its dispatches, due to the fact that any receiving apparatus placed within the zone of electric influence emanating from the transmitting instrument may be operated by the latter, and the telegraph messages thus intercepted.

The apparatus invented by the writer preserves the secrecy, by preventing the message from being deciphered by a receiving instrument placed at an intermediate point.

The invention is based on the principle that the electric undulations may be varied, according to the adjustment of the two metal spheres forming the spark gap in the oscillator, as they are more or less distant from each other.

It follows that in suitably varying the space which separates these two spheres, that is to say, by increasing or diminishing the length of the oscillators' spark gap, we may regulate quite accurately the distances to which the electric waves may extend to reach a receiving station.

Essentially the invention consists in combining the transmitter of the aerial line, which we designate by A, with a second transmitter A', which an operator manipulates in an indeterminate manner to generate long and short impulses, which mingle with the impulses from the transmitter A. These electric waves are so regulated as to produce an active zone from the transmitter A', which will extend to a distance somewhat less than that to which the oscillator of the transmitter A has been regulated.

Under these conditions the electric waves sent out by the transmitter, A and A,' are mingled in such a manner that any receiving apparatus placed within the reach of transmitter A' could receive only a meaningless mixture of dots and dashes from which it would be impossible to make out the signals sent from the transmitter A.

Thus it becomes possible to interpret the signals from the transmitter A, only by an instrument placed beyond the range of transmitter A'.

Security will become greater as the active zone from transmitter A' approaches the active zone emanating from transmitter A. Finally to obtain additional security by this system of wireless telegraphy, we may combine with transmitter A several transmitters similar to A', as A'', A''', etc., each regulated for varying distances, as the drawings set forth. The whole of the telegraphic apparatus consists of a station transmitter A, and a station receiver B. The station A contains an induction coil A in the primary circuit, in which is intercalated the interrupter B and the key C, while the secondary circuit is connected to the oscillator D, which is in circuit with the earth and the mast e.

The station A contains in addition a secondary transmitting apparatus A', composed of the same essential parts as the first, that is, it contains an induction coil A', with interrupter B', an operating key C' and an oscillator D', connected like the preceding to the mast C.

In the second transmitting apparatus the sending key C' is operated in any indiscriminate way, either by hand or by mechanical

* Translated from "La Vie Scientifique," Paris, for ELECTRICITY.

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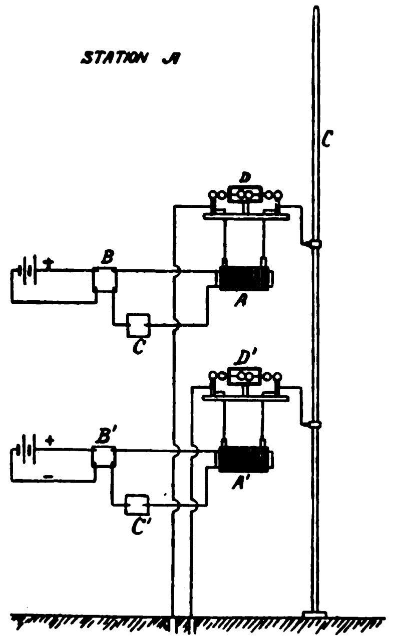
means, and in such a way as to send out short and long signals which will confuse the signals sent out by key C.

The key of the second apparatus A', might also be kept open during the whole time that the message is being sent from the true transmitter A, and by so doing, any receiver which is within the active zone of the second transmitter A', would register only a plain continuous line.

The separation of the oscillator balls D, is regulated to such a distance that the electric waves sent out by this apparatus reach the re-



ceiving station B; but on the contrary the separation of the similar parts in oscillator D' are so determined that the electric oscillations of the latter instrument are slightly weaker than those generated in the true transmitter A.

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The receiving station contains the usual apparatus, a receiving mast F, the counterpart of the mast E, connected to a coherer G, having one terminal connected to earth and the other connected in circuit with a battery and a polarized relay I connected to earth; the polarized relay I is operated when the coherer G becomes a conductor through the influence of the electric waves by closing the circuit of the local battery J, which operates a receiving register K, and the electric decoherer L, which is used to immediately restore the coherer to its usual resistance.

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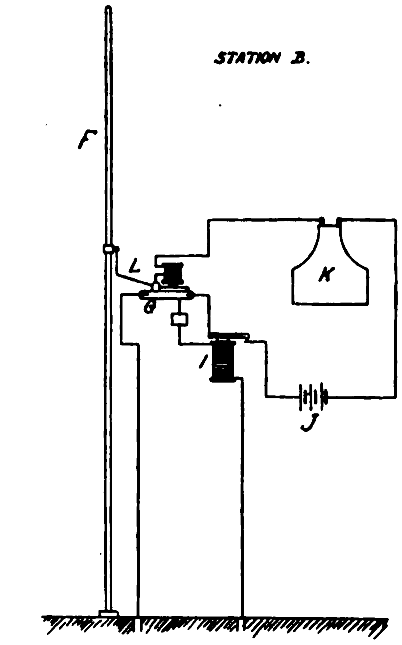

the cost for a 50-candle power light being only a quarter of a cent per hour. The gas is said to be 93 per cent. atmosphere, is non-poisonous, non-explosive and odorless, manufactured by a plant of simple construction, easy and clean to manage, which, being automatic, only requires little attention. The light is similar to solar rays, inasmuch as all colors are seen in their natural shades when viewed in it. Captain Foxell of Philadelphia, Pa., has introduced the illuminant in Canada, and has associated with him in Ottawa Mr. J. R. Booth, the millionaire lumberman, and Mr. J. A. Seybold, in whose dry goods warehouse the plant is now installed and in operation.

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Furthermore the cost to install a hundred-ton furnace on the blast furnace principle would be from $100,000 to $145,000, while we can install our furnace for $40,000, with a saving of over 50 per cent. in the operating expense.

I show you a carbon that has stood 25 hours' run, and also a new carbon with which to compare it. Only a fraction of a hair in thickness is worn off the used carbon. I make my connection by screwing a copper bolt directly into the carbon. Seven sections of the carbons are placed in the furnace and set in a ring. The ore covers the three bottom sections. The furnace revolves at the rate of half a revolution a minute. We fill in the center and tap it at the bottom. In treating bessemer ore we close our furnace air tight, and raise the temperature to flux. After the ore fluxes we draw off the slag, and then we have the iron in the shape of cast pig. If we wish to puddle it into steel, we do it without removing the ore, simply by increasing the speed and increasing the temperature about 200°, and having a rapid flow over these carbons at a higher temperature, which works the water out and puddles it into steel. Then we can tap it into steel pig. But if we desire we can drop the electric current into a lower heat, to 400° below the melting point of steel, lower the speed to one-half a revolution per minute, and that gathers it into a bullion, catch it with the tongs and it is ready for the rollers.

Thus we do three processes in one and get 45 times the amount of heat.

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THE LIGHTING OF SMALL TOWNS.*

BY G. M. HARRIS,
Electrical Engineer, Bray, Ireland.

The lighting of small towns is a problem requiring very careful consideration, not by reason of any engineering difficulties, but by reason of the difficulty of making such an undertaking pay.

On account of the profits being necessarily small, the lighting of small towns will continue to receive little attention from private companies, except they be very plucky ones. The matter will therefore be left for the consideration of the local authority, who will be content, or at all events should be, if at a reasonable cost they are enabled to carry out the public lighting of the town, and at the same time place a supply of electricity at the disposal of its inhabitants.

The measure of the success of such an undertaking should then be judged, not by actual return made in the shape of profit shown, but upon truly municipal lines, i.e., by the efficiency and cost of the public lighting and the rate at which a supply of electricity is obtainable for private use.

Small towns mean small consumers and usually a scattered area.

The distributing charges will be heavy, so that if there is to be any hope of success the generating charges must be light, which means that the site for a generating station must have very special natural advantages, such as good water power or facilities for cheap fuel, or a combination of the two.

Where there are no such advantages there appears to be no alternative but to wait for the great power companies to pick up such small areas as may be within their reach or upon the direct line of route of their mains to larger ones.

Assuming that the conditions are favorable for generating or obtaining a supply at a low cost—at the commencement the public lighting should be provided for and taken over, and provision only made for private consumers where such are certain to come on in a reasonable time.

The policy of laying the mains for private use well in advance of the demand, though justified in wealthy areas, would not be so in small towns where the conditions are different.

The prospect of profit in supplying small and scattered consumers being very small, there is no room for speculation, and it is of the utmost importance that the capital expenditure be kept as low as possible, and that no capital should be unproductive.

It therefore follows that the system of distribution should possess the maximum of flexibility at the minimum of cost.

Now that distribution up to 200 volts has been successfully established, there are of course many towns where direct current would be feasible and no doubt preferable, but in the majority of cases high pressure alternating current with transformers in street pits and occasionally in houses would be better; where the area comprises a number of private houses and mansions standing in their own grounds and of necessity widely scattered but nevertheless desirable to reach, the alternating system is the only one commercially possible. This question, however, will of course be governed by the circumstances in any particular district, but the question of the actual cost of mains will always remain—a serious item telling against economical distribution on a small scale.

It is therefore the object of this paper to deal with the matter of cheap mains and main laying, that being, I consider, the most important point, the one which lies nearest towards a solution of the problem under consideration.

I therefore propose to bring to the notice of this association two cheap and effective methods of main-laying, of which I have had experience at Bray. First as to the mains in operation at Bray—there have been over six miles of high and 27 miles of low tension laid direct in the ground since 1892, and during that time we have never had a fault on the main line of cables themselves, except where mechanical injury had caused it, and this has very seldom happened. Any trouble we have had has been due to defects in the filling material of the jointing boxes, now overcome, so that this system of laying may claim to have been well tried. In fact, I think the Bray mains are the oldest paper-insulated cables in the Kingdom, other than those from Deptford.

The cables are concentric lead-covered and unarmored. They are taped, but this is, in my opinion, a disadvantage.

In laying, the bottom of the trench was covered with about 3 inches of puddle clay, well wrought, the cables laid in and covered with another 3 inches of puddle clay, evenly put on, and a 7 in. by 1 in. board placed on top, the trench being then filled.

Latterly the timber used for mechanical protection has been larch, being simply the small larch trees, 7 in. thick in the butt, sawn in half; this timber stands well in the ground, requiring no special treatment to preserve it, is cheaper than deal boards and more effective, being thicker. The effect of the puddle clay, impervious to moisture, is to protect the lead covering from any contact with acids or salts in the soil which would attack it, and it has proved so effective that when the cable is now, after eight years, exposed, the lead is absolutely unattacked.

The braiding of the cables has rotted, proving to have been an unnecessary expense. It might prove a source of danger if it allowed a passage of water charged with matter which would attack lead, the life of a lead-covered cable being practically the life of the lead.

As to the jointing, no clips are used; the inners are married and soldered in the usual way, the outer wires are drawn to one side and soldered together forming a loop, all soldering being done well clear of the cable insulation.

The joint is contained in a cast-iron joint box divided longitudinally on the line of two bottle necks for entrance and exit of cable and having on the top side a large hole for filling, (not less than 1 in.) and a smaller hole as air vent, closed by screwed plugs. The cables are served with spun-yarn up to the diameter of the bottle necks and no other packing of the glands is found necessary. The joints having been made and the box screwed up, molten pitch is poured in; the outer side of the bottle necks, beyond the spun-yarn serving, is also filled in with pitch, hollows being formed in the clay for the purpose and here fine clay mixed with the pitch forms a cement which effectually seals up the bottle necks and protects the cable from injury where they enter and leave the box. Such a joint is cheaply made and fulfills every requirement.

It demands only care and requires absolutely no special skill, a very important matter in a small town. This and the fact that it is both electrically and mechanically sound, gives a joint so made, advantages which no form of joint made with clips, that the writer has seen, can claim.

Where any transformer pits lie on the route all cables are brought into the pits and are joined there, inners and outers, with loops of rubber covered single cables. Disconnection of any length of cable for tracing a fault is done by snipping these loops and this works well under our conditions.

Of course in a large scheme where the expense was no object, disconnecting boxes would be preferable, but when used they should certainly be placed in pillars above ground, and so above the reach of flooding, and not in water tight boxes under ground.

As far as the writer is aware the insulation resistance of mains in operation is not easily obtainable. This, however, in no way reflects on the cables; it is partly due to the fact that originally oil was used in the joint boxes but was soon abandoned, not however before the cable ends had suffered, due to water mixing with the oil; the repairing of these ends accounts for the large number of joints. The main cause of the low insulation is due to the large number of joint boxes which still contain a mixture of tar and pitch (the tar having been added as a precaution against cracking of the pitch). This mixture is inferior in every way to the pitch alone which is now always used.

The fact that the resistance from the inner to the outer is in the majority of cases greater than that to the earth is no doubt accounted for at the joints, where the resistance of the pitch has been weakened in the manner indicated, and the surface of the outer is small in comparison to the surrounding box. Their condition, however, causes no anxiety at Bray, as the tests are practically identical with those taken in 1893; the cables have been perfectly steady all along and have lived to see much of the more elaborate and costly draw-in system placed on the scrap heat.

Sufficient has been said perhaps to show that such a system of laying and jointing mains is cheap and reliable, in any case in which no danger from electrolytic action is feared—as where for instance a tram line passed through a town—in such a case the lead would need protection, and recourse to some solid system seems inevitable; but a small town cannot afford the luxury of lead-covered cables laid in this way, and the lead seems to me quite unnecessary, serving no purposes which would not be equally served by any cheap covering which would protect the insulation from damp up to the time of being laid, after which it requires no such protection.

If the cables are concentric the outer insulation can be reduced to that thickness which, with the filling, suffices for the voltage carried; if the cables are not concentric then the covering of each may be reduced to that thickness which, with the filling, is good enough.

The question is, how much the insulation, other than that of the filling compound, may be reduced?

My impression is, that driven by consideration of cost, we shall see this extra insulation year by year reduced in amount till, for low voltage, we come to the bare conductor laid on insulators in the solid filling, and for higher voltage, conductors laid on the same system with very slight extra insulation, relying mainly upon the filling compound.

*Abstract of paper read before the Municipal Electrical Association.

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The key of the second apparatus A', might also be kept open during the whole time that the message is being sent from the true transmitter A, and by so doing, any receiver which is within the active zone of the second transmitter A', would register only a plain continuous line.

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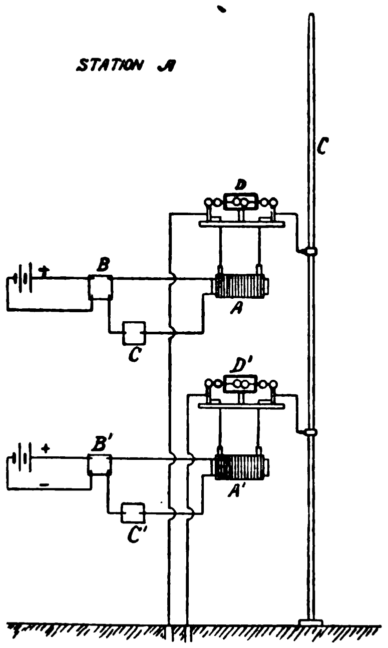

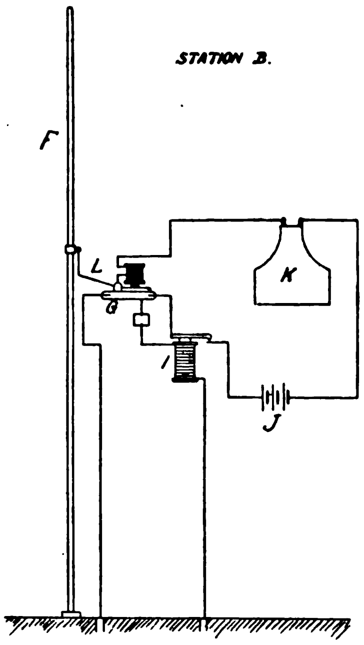

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The prospect of profit in supplying small and scattered consumers being very small, there is no room for speculation, and it is of the utmost importance that the capital expenditure be kept as low as possible, and that no capital should be unproductive.

It therefore follows that the system of distribution should possess the maximum of flexibility at the minimum of cost.

Now that distribution up to 200 volts has been successfully established, there are of course many towns where direct current would be feasible and no doubt preferable, but in the majority of cases high pressure alternating current with transformers in street pits and occasionally in houses would be better; where the area comprises a number of private houses and mansions standing in their own grounds and of necessity widely scattered but nevertheless desirable to reach, the alternating system is the only one commercially possible. This question, however, will of course be governed by the circumstances in any particular district, but the question of the actual cost of mains will always remain — a serious item telling against economical distribution on a small scale.

It is therefore the object of this paper to deal with the matter of cheap mains and main laying, that being, I consider, the most important point, the one which lies nearest towards a solution of the problem under consideration.

I therefore propose to bring to the notice of this association two cheap and effective methods of main-laying, of which I have had experience at Bray. First as to the mains in operation at Bray—there have been over six miles of high and 27 miles of low tension laid direct in the ground since 1892, and during that time we have never had a fault on the main line of cables themselves, except where mechanical injury had caused it, and this has very seldom happened. Any trouble we have had has been due to defects in the filling material of the jointing boxes, now overcome, so that this system of laying may claim to have been well tried. In fact, I think the Bray mains are the oldest paper-insulated cables in the Kingdom, other than those from Deptford.

The cables are concentric lead-covered and unarmored. They are taped, but this is, in my opinion, a disadvantage.

In laying, the bottom of the trench was covered with about 3 inches of puddle clay, well wrought, the cables laid in and covered with another 3 inches of puddle clay, evenly put on, and a 7 in. by 1 in. board placed on top, the trench being then filled.

Latterly the timber used for mechanical protection has been larch, being simply the small larch trees, 7 in. thick in the butt, sawn in half; this timber stands well in the ground, requiring no special treatment to preserve it, is cheaper than deal boards and more effective, being thicker. The effect of the puddle clay, impervious to moisture, is to protect the lead covering from any contact with acids or salts in the soil which would attack it, and it has proved so effective that when the cable is now, after eight years, exposed, the lead is absolutely unattacked.

The braiding of the cables has rotted, proving to have been an unnecessary expense. It might prove a source of danger if it allowed a passage of water charged with matter which would attack lead, the life of a lead-covered cable being practically the life of the lead.

As to the jointing, no clips are used; the inners are married and soldered in the usual way, the outer wires are drawn to one side and soldered together forming a loop, all soldering being done well clear of the cable insulation.

The joint is contained in a cast-iron joint box divided longitudinally on the line of two bottle necks for entrance and exit of cable and having on the top side a large hole for filling, (not less than 1 in.) and a smaller hole as air vent, closed by screwed plugs. The cables are served with spun-yarn up to the diameter of the bottle necks and no other packing of the glands is found necessary. The joints having been made and the box screwed up, molten pitch is poured in; the outer side of the bottle necks, beyond the spun-yarn serving, is also filled in with pitch, hollows being formed in the clay for the purpose and here fine clay mixed with the pitch forms a cement which effectually seals up the bottle necks and protects the cable from injury where they enter and leave the box. Such a joint is cheaply made and fulfills every requirement.

It demands only care and requires absolutely no special skill, a very important matter in a small town. This and the fact that it is both electrically and mechanically sound, gives a joint so made, advantages which no form of joint made with clips, that the writer has seen, can claim.

Where any transformer pits lie on the route all cables are brought into the pits and are joined there, inners and outers, with loops of rubber covered single cables. Disconnection of any length of cable for tracing a fault is done by snipping these loops and this works well under our conditions.

Of course in a large scheme where the expense was no object, disconnecting boxes would be preferable, but when used they should certainly be placed in pillars above ground, and so above the reach of flooding, and not in water tight boxes under ground.

As far as the writer is aware the insulation resistance of mains in operation is not easily obtainable. This, however, in no way reflects on the cables; it is partly due to the fact that originally oil was used in the joint boxes but was soon abandoned, not however before the cable ends had suffered, due to water mixing with the oil; the repairing of these ends accounts for the large number of joints. The main cause of the low insulation is due to the large number of joint boxes which still contain a mixture of tar and pitch (the tar having been added as a precaution against cracking of the pitch). This mixture is inferior in every way to the pitch alone which is now always used.

The fact that the resistance from the inner to the outer is in the majority of cases greater than that to the earth is no doubt accounted for at the joints, where the resistance of the pitch has been weakened in the manner indicated, and the surface of the outer is small in comparison to the surrounding box. Their condition, however, causes no anxiety at Bray, as the tests are practically identical with those taken in 1893; the cables have been perfectly steady all along and have lived to see much of the more elaborate and costly draw-in system placed on the scrap heat.

Sufficient has been said perhaps to show that such a system of laying and jointing mains is cheap and reliable, in any case in which no danger from electrolytic action is feared—as where for instance a tram line passed through a town—in such a case the lead would need protection, and recourse to some solid system seems inevitable; but a small town cannot afford the luxury of lead-covered cables laid in this way, and the lead seems to me quite unnecessary, serving no purposes which would not be equally served by any cheap covering which would protect the insulation from damp up to the time of being laid, after which it requires no such protection.

If the cables are concentric the outer insulation can be reduced to that thickness which, with the filling, suffices for the voltage carried; if the cables are not concentric then the covering of each may be reduced to that thickness which, with the filling, is good enough.

The question is, how much the insulation, other than that of the filling compound, may be reduced?

My impression is, that driven by consideration of cost, we shall see this extra insulation year by year reduced in amount till, for low voltage, we come to the bare conductor laid on insulators in the solid filling, and for higher voltage, conductors laid on the same system with very slight extra insulation, relying mainly upon the filling compound.

*Abstract of paper read before the Municipal Electrical Association.

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The inevitable result of this will be that we shall, for the conductors, use iron or other metal, or alloy, cheaper than copper, since the prohibitive cost of the increased insulation due to bigger cross-section for the same conductivity for such metals, will not have to be faced. At Bray we tested some years ago 80 yards of bare copper mains laid on the solid system, and although roughly laid and badly insulated, the filling compound being a mixture of bitumen, tar and sawdust, this nevertheless stood 1,000 volts for 12 months, and 100 volts for two years afterwards, and was then only taken up on account of building extensions.

From that experiment and subsequent experience I believe it is perfectly possible even now for voltage, say up to 500, covering all low-tension distribution for light and traction, to use wires covered with say a few layers of paper and a light braiding varnished, and the whole laid in troughing filled in with plain pitch at 10s. per ton, which, for all sizes of copper above, say 0.25 in. sectional area, would be cheaper that any cable in the market.

Whatever be the nature of the solid system, the compound for filling both joints and troughing should be ordinary pitch, which has the advantage that it can with ease be chipped out, and is cheap.

CANADIAN NOTES.

The council for the town of Cannington, Ont., will submit a by-law to the ratepayers of the town for the purpose of effecting a loan with which to establish an electric lighting plant to be owned and operated by the municipality.

The Cataract Power Company of Hamilton, Ont., has installed two new generators in its power house at Decew Falls. By the additional power thus provided the company will furnish the city with 6,000 horse-power.

The sub-station of the Lachine Rapids Hydraulic Company at the corner of St. Thomas and McCord streets, Montreal, has been destroyed by fire. The fire originated in a defective switch and in a very short time the entire plant, which distributed the power received from the Lachine Rapids to the various parts of the city, was completely demolished. The loss is about $30,000.

Some time ago the city engineer of Toronto was instructed to prepare an estimate of the cost of constructing buildings and all the necessary plant for the distribution of electric energy in that city. He states that the buildings and plant would cost $950,000 and the cost of installing an arc lighting plant, with a capacity of 1,350 lamps, would be $300,000. If the wires were placed under ground in the central portion of the city the cost is estimated at about $510,000. The annual cost of operating the plant with overhead wires would come to about $63 per lamp per annum, or about 17.2 cents per night.

Mr. George Johnson, of Ottawa, the Dominion statistician, has compiled some interesting figures about the electric railways of Canada. During the year ended on December 31, 1899, the 632 miles of track were so used that the total number of miles run by cars was 26,646,847. The number of passengers carried was 104,033,659. Compared with the previous year, the number of passengers carried increased nearly 9,500,000, and the number of miles run by over a million. The amount of paid up capital invested in electric railways in the Dominion is $21,700,000. The electric cars traveled over four million more miles than the passenger and mixed trains of the steam railways. Together the steam and electric railways carried over 120,000,000 passengers, and the proportion was about 13 by steam to 87 by the electric railways.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended July 5:

Antwerp, 47 packages, $3,383; Argentine Republic, 211 cases, $9,047; Australia, 157 packages, $13,136; 1 electric motor, $170; Barcelona, 2 cases, $30; Brazil, 43 packages, $2,492; 8 cases, $826; British Guiana, 80 packages, $8,262; Bristol, 5 cases, $234; British West Indies, 160 packages, $219; 13 cases, $550; British East Indies, 5 cases, $526; Brussels, 12 cases, $435; Central America, 12 packages, $72; Copenhagen, 2 cases, $30; Cuba, 12 packages, $186, Danish West Indies, 2 packages, $55; 17 reels electric cable, $8,331; Dundee, 3 cases, $337; Ekatrinoslaf, 4 cases electric motors, $7,121; Glasgow, 116 packages, $30,981; -- packages electric cable material. $6,718; 269 packages electric motors, $18,180; Havre, 126 cases, $8,429; 2 cases electric vehicles, $5,000; 1 automobile, $1,500; 4 cases automobile parts, $325; 15 packages, motor trucks, $1,550; Hamburg, 232 packages, $22,909; Hayti, 46 packages, $1,233; Liverpool, 52 packages, $5,573; London, 4 cases automobiles, $1,700; 3 cases motors, $450; Manchester, 18 packages, $8,100; Mariopal, 18 cases, $3,754; Marseilles, 9 cases motors, $850; 35 packages, $277; Mexico, 1 automobile, $3,300; 7 boxes automobile parts, $480; 25 cases, $1,505; 72 packages, $11,480; Middleborough, 6 cases, $1,000; Newcastle, 1 case, $365; Nice, 15 cases, $1,572; Porto Rico, 49 cases, $2,318; Rotterdam, 4 packages, $10; Southampton, 225 packages $1,892; Stockholm, 7 cases electrical vehicles, $1,020; St. Petersburg, 3 packages, $20, U. S. Colombia 28 cases, $560; Venezuela, 62 cases, $390.

PERSONAL MENTION.

Mr. Pierre O. Keilholtz, who has been general manager of the United Electric Light & Power Company of Baltimore, Md., since its formation, was recently elected consulting engineer. Mr. John W. Ellard is now general manager.

Mr. Robert K. Gray, of the Telegraph & Maintenance Construction Company of London, Eng., arrived in this city last week. Mr. Gray's business here is in connection with the laying of the new commercial cable from Coney Island to Fox Bay, N. S.

Mr. E. W. Crone, of Pittsburg, Pa., representing the Westinghouse Company, recently went to Orizaba, Mex., to install an electric plant.

INCORPORATIONS.

The Pulaski Electric Light Company, Pulaski, N. Y. Capital stock, $16,000. Directors: Albert F. Betts, William J. Peach and George W. Betts, Pulaski.

The Richmond County Power Company, Albany, N. Y.—to manufacture electricity for light, heat and power. Capital stock, $500,000. Incorporators: S. Thomas, W. E. Findley, both of New York City; M. L. Ryan of New Brighton; F. T. Lewis, O. B. Proal, Jr., N. P. Findley, J. H. Swinerton, all of West New Brighton.

The Croton Electric Light and Power Company, Cortlandt, N. Y. Capital stock, $10,000. Directors: James Murray Mitchell, Robert P. Barry and Armitage Mathews, New York City; Henry M. Haviland, Brooklyn; Joseph R. Swain, Sing Sing.

The Suffolk Engraving and Electrotyping Company, Portland, Me.—to do a designing, drawing, etching and engraving business. Capital stock, $100,000. Officers: President, A. J. Desmond; treasurer, H. L. Cram, both of Portland, Me.

The St. Lawrence Gas, Electric and Transportation Company, Trenton, N. J. Capital stock, $400,000. The company is a consolidation of the gas, electric light and trolley companies of St. Lawrence County, N. Y., and it is understood is controlled by the Widener-Elkins syndicate.

The Sea Side Electric Light, Heat and Power Company, Rockaway Beach, L. I. Officers: William G. Wainwright, president; John Remsen, vice-president; John W. Wainwright, treasurer; John E. Tator, secretary.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED JULY 3, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

653,154. Car-Fender. James Sullivan, Boston, Mass. Filed March 29, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

653,088. Incandescent Electric Lamp. Josef Plechati, Berlin, Germany. Filed Nov. 13, 1899.

653,068. Electric Lamp Socket. Walter A. Church, Pittsburg, Pa. Filed Dec. 21, 1899.

653,159. Electric Headlight Lamp. Harlan P. Wellman, Ashland, Ky. Filed Dec. 14, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

652,856. Speed Governor for Electrical Controllers. James H. McGurty, Jersey City, N. J. Filed March 31, 1900.

652,952. Magneto-Electric Motor. Everett M. Andrews and Melvin N. Andrews, Des Moines, and Charles M. Conger, Adel, Iowa. Filed May 10, 1900.

652,990. Electric Transformer. James J. Wood, Fort Wayne, Ind. Filed March 31, 1900.

653,087. Electric Controller. Slaughter W. Huff, Baltimore, Md., assignor of one-half to Jesse Hilles, same place. Filed July 12, 1898. Renewed June 9, 1900.

653,088. Apparatus for Exciting Alternating-Current Dynamo-Electric Machines. Maurice Hutin and Maurice Leblanc, Paris, France. Filed April 18, 1899.

653,089. Exciter for Alternating-Current Dynamo-Electric Machines. Maurice Hutin and Maurice Leblanc, Paris, France. Filed Nov. 22, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

652,745. Device for Cleaning Telephone-Mouthpieces. Marian N. Clarke, Wilkes-Barre, Pa. Filed Aug. 24, 1899.

652,922. Telephone-Switch. Osgood Plummer, Worcester, and Charles E. Monroe, Boston, Mass., assignors to Frank O. Plummer, Boston, Mass. Filed Jan. 4, 1900.

652,926. Sound Transmitting and Receiving Device. Colin Salmond, San Francisco, Cal. Filed Sept. 7, 1899

652,928. Telephone-Exchange System. Walton Smith, Ridley Park, Pa., assignor to James S. Thompson, North Tonawanda, N. Y. Filed March 28, 1899.

652,977. Signaling Apparatus for Telephone-Switchboards. Joseph J. O'Connell, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 25, 1899.

653,156. Apparatus for Transmitting Sounds. Elliott Toxey, Mobile, Ala. Filed July 25, 1899.

MISCELLANEOUS.

652,748. Manufacture of Electrical Fuses or Current-Arresters. Francis A. Cote, Ottawa, Can., assignor of four-fifths to Toussaint G. Coursolles, same place, and Frederic L. Beique and Charles F. Sise, Montreal, Canada. Filed March 31, 1899.

652,753. Electrical Time-Recorder. Edward Davis, Boston, Mass., assignor to Meyer A. Bernheimer and Ralph W. Gordon, New York City. Filed June 12, 1899.

652,761. Electrolytic Production of Caustic Soda, etc. Justus B. Entz, Philadelphia, Pa., assignor to the American Alkali Company of New Jersey. Filed May 6, 1899.

652,800. Gramophone Sound-Box. Henry S. Montgomery, Topeka, Kans. Filed Aug. 15, 1899.

652,806. Flexible Electrical Conduit. Harry G. Osburn, Chicago, Ill. Filed Dec. 8, 1898.

652,846. Process of Purifying and Strengthening Brine for Use in Electrolytic Cells. James Hargreaves, Farnworth-in-Widnes, Eng. Original application filed Feb. 12, 1898. Divided and this application filed Aug. 29, 1898.

652,851. Automobile Vehicle. Hosea W. Libbey, Boston, Mass. Filed Oct. 2, 1899.

652,867. Electrical Drying Apparatus. Jean M. J. E. Vignon-Danto, Lyons, France. Filed April 15, 1899.

652,875. Electric-Clock Pendulum. Ernest K. Adams, New York City. Filed Nov. 7, 1899.

652,934. Electric Device for Indicating the Awakening of Persons Buried Alive. Walter J. McKnight, Buffalo, N. Y. Filed May 20, 1899.

652,949. Running-Gear for Automobiles. Charles Cotta, Shannon, Ill. Filed Jan. 17, 1900.

653,093. Apparatus for Supplying Currents of Predetermined Voltage From Main Lines of Higher Voltage. William W. King, Huntsburg, Ohio. Filed Oct. 30, 1899.

653,132. Circuit-Controller. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Sept. 23, 1899.

653,167-653,168-653,169-653,170-653,172. Motor-Vehicle. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan New York City. Filed Aug. 11, 1899, filed Aug. 21, 1899 filed Oct. 2, 1899.

653,173. Refrigeration Apparatus. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan, New York City Filed Oct 14, 1899.

653,199. Motor-Vehicle. John H. Munson, Chicago, Ill. Filed May 16, 1898.

653,200. Independent Motor-Vehicle. John H. Munson, La Porte, Ind., assignor of one-half to William F. Roberts, same place. Filed Aug. 29, 1898.

REISSUE.

11,837. Telephone Repeater. William M. Davis, Chicago, Ill., assignor to the Stromberg Carlson Telephone Manufacturing Company, same place. Filed Feb. 9, 1900. Original No. 625,247, dated May 16, 1899.

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THE TELEPHONE WORLD.

Telephone Service in Sydney, Australia.

The board recently appointed to inquire into the working of the Sydney telephone service, which for some time after the change to the new switchboard seemed entirely disorganized, has handed its report to the Postmaster General, says the "Australian Mining Standard." The constitution of the board, comprising as it did, one well-known electrician in official service and two in private practice, is an ample guarantee of their competence to sift to the bottom the various irregularities which were complained of, and the impression conveyed by their report is that their work has been well and thoroughly done. One recommendation, and that perhaps the most important of all, was generally looked for. It is that complete metallic currents be adopted throughout the service. This means giving each subscriber a metallic return for the current, as well as the single line which conveys the message. This will be a costly and onerous undertaking, but may, perhaps, be accomplished gradually. Already a commencement is being made with trunk lines connecting the suburban with the central exchange. Until the metallic circuit is provided there will always be annoyance from hearing the conversation of others and from noises produced by the operations of the electric tram, power and lighting operations, which are now becoming so numerous. About three-fourths of the cities which possess a telephone business of the magnitude of that of Sydney have already adopted the metallic circuit, and it can only be a question of time when Sydney and the other Australian capitals follow their example. The greatest interest, however, was excited by the explanations expected of the difficulties which have been experienced in getting the exchange; in being rung up in mistake for the exchange; in being switched on to the wrong subscriber; or being cut off in the midst of a conversation. It is gratifying to learn that these troubles appear to admit of a prompter remedy than that which will be provided by the attractive, but somewhat remote, prospect of the establishment of the metallic circuit. These and other similar aggravating mishaps appear to have been almost altogether due (1) to defects in the working of the new switchboard; and (2) to the operators having too many lines to attend to, and being puzzled by some of the alterations in their practice, which were rendered necessary by the change of boards. In connection with the first the board recommends (*a*) that immediate steps be taken to secure satisfactory working of the indicators. (*b*) That a supply of plugs and coils be immediately obtained. (*c*) That a re-arrangement of the power plant be effected with a view to secure an adequate minimum current at the switchboard terminals, and to provide for the working of the transmitters by a separate battery. With a view to check the use of the lines by non-subscribers, and thus to reduce the amount of work, the adoption of a "toll" system or a charge according to the number of outgoing messages, is strongly recommended. But, pending the adoption of this suggestion, the board states that a reduction should be made in the number of subscribers' lines allotted to each operator. This affords practical proof that the operators have been overworked. It is stated, moreover, that at the time of taking over the new switchboard the staff, instead of being strengthened in the manner that would naturally be called for by the extra work entailed by the change, was reduced by sickness and excess of work. Owing to this cause, the supervision of the operators was not as thorough and complete as desirable.

Indications are that a first-class telephone war will be inaugurated in Iowa Falls, Ia., within the next few weeks, and already skirmishes that foretell the coming fray have occurred, and open hostilities may develop any day. The war will be between the Hawkeye Telephone Company, an independent organization with headquarters in that city, and the Iowa or Bell Telephone Company of Davenport. The former company has just installed a fine exchange system, and has a list of 125 'phones in Iowa Falls. This has crippled the local business of the Bell Company to some extent, and a slash in rates has been announced, making business telephones $1 a month, and residences 75 cents. The Iowa company proposes to better equip its plant, and put up a big fight for the bulk of the city business, while the new company has a big lead in business, so that the ultimate result of the war is naturally watched with much interest.

The New England Telephone & Telegraph Company is to establish a new telephone system in Portland, Me., owing to the fact that the present switchboard is inadequate to the needs of the exchange. It will probably be two years before the new system, which is the latest thing in telephone improvement, is fully completed.

The White Mountain Telephone Company intends, within the next three or four months, and sooner if poles can be obtained, to build a telephone line from Bangor to Houlton, Me.

Two Women Telephone Owners.

There are said to be only two women in the United States who own and operate public telephone systems themselves. One of these is Miss Angie Fruchy, of McComb, O., who attended the National Telephone Convention in Cleveland recently. One of the New Yorkers present said she was able to give quite as many pointers as she received.

When the telephone fever swept over the country several years ago, Miss Fruchy conceived the notion of building a telephone system in her town. The idea met with the hearty support of her friends, and all the business people subscribed. Now she has 100 customers. She charges $24 a year for business service, and about $15 for house service.

A girl operates the central station, and a boy attends to the stringing of wires. Having made a success of local service, Miss Fruchy has built a line about ten miles long from McComb to Findlay, thereby enabling her patrons to talk with people in almost any part of Ohio. Those who are familiar with the business say it pays $2,000 a year.

The other public telephone service owned and operated by a woman is in Asheville, N.C. The proprietress is a daughter of a former Secretary of Agriculture. It is understood that she is doing a thriving business. In both cases there are rarely any complaints from the patrons, and the service is always prompt.

R. Petsch of Berlin, who has lately been visiting at Washington, D. C., is the councillor of the Postal Telegraph Service of the German Empire. As councillor, he has charge of the entire German telephone system. "I am," he said, "investigating the methods in vogue in this country, and am seeking the points of superiority, especially in insulation, that exist here. My inspection is made in an official capacity and I am here as the representative of my Government. There is little difference in method between us. Our exchanges are all manipulated by girls as is done here, and everything else except in minor details is much the same. Of course there are no competing telephone lines, as the whole system is under the control of the Government. That government ownership is a success I think is best attested by the number of our subscribers. In Berlin alone there are 40,000 subscribers, who are divided among nine stations. The largest station has 7,000 'phones, a number that I believe is only exceeded by a station in New York City. Our rates average about as in this country. The highest rate charged is about 180 marks per annum, or about $43. The lowest rate is 120 marks for 400 calls with a supplementary rate of 1½ cents for each additional call. The longest telephone line in Europe is between Berlin and Paris, a distance of 1,600 kilometers, or nearly 900 miles. This is the second longest in the world, that from New York to Chicago being somewhat over that distance." Mr. Petsch will return to Germany in about one month.

A competitor of the New England Telephone Company, with its line in Calais, Me., is now open for business. The people of that city are enabled to talk with parties in the towns of Princeton, South Princeton, Brookton, Waite, Talmadge, Alexander, Danforth, and other places hitherto out of reach by wire. The new concern, which is known as the Lakeside Telephone & Telegraph Company, was organized at Princeton, Me., in 1897, as the Princeton Telephone & Telegraph Company with a capital of $10,000, the name being in the following year changed to Lakeside. Under the charter granted under general laws the company has the right to extend its line from Houlton to Machias, through the towns of Hodgdon, Amity, Orient, Danforth, Brookton, Waite, Talmadge, Indian Township, Princeton, Alexander, Baileyville, Baring, Calais, Charlotte, Dennysville, Cooper, Meddybemps Crawford, Wesley, Northfield, Marshfield; also from Topsfield, to Kingman through Kossuth, Carroll, Springfield, Webster, Prentiss, Drew and Winn.

The village of Charlotte, N. Y., recently granted a new franchise to the Bell Telephone Company, and the company has been putting in new 'phones and stringing new wires. About fifty new 'phones have been installed. The exchange building, which has been undergoing erection during the past few weeks, is about completed.

The civic board of control of Toronto, Canada, purposes to operate a municipal telephone system of from 6,000 to 10,000 subscribers, and plans are being prepared. The Bell Company charges $45 yearly for business and $25 for house telephones, and will not put in new ones except for a material increase in rates.

The Jefferson County Telephone Company has been extending its telephone connections to a good part of the State of Iowa. Within the next month the company expects to have connections with Eldon, Keosauqua, Bloomfield, Ottumwa and Oskaloosa.

The telephone line between Fort Stockton and Pecos, Tex., is now complete.

Telephone Improvements in Germany.

United States Consul Worman at Munich informs the State Department of the forming of a syndicate in Germany, under the auspices of the Bank of Darmstadt, to bring into practical use certain telephone improvements that have been tested in Government offices. These inventions are said to make it possible to retain the spoken word, and to repeat it as freely as desired; to use the same wire for simultaneous conversation by different parties; to repeat the same conversation at various points, and to strengthen the sounds so as to make the long-distance telephone operate with better results.

An event of interest to the officials of Columbus, O., and the Central Union Telephone Company, recently took place when a test of a new magnet fire alarm system was made between Columbus and Springfield over the wires of the telephone company. Each fire alarm box has three magnets and a spring mechanism which produces the current without batteries. There is also a tester which tests the circuits every 2½ minutes to show whether the circuits are in order. If the wire is broken the bell will ring. It is claimed that this system will save the cities thousands of dollars annually by doing away with the batteries.

With the completion of the improvements which the Southern Bell Telephone Company is making in its Columbus (Ga.) exchange, there will be a marked reduction in telephone rates to subscribers. In addition to this a new schedule of rates for different kinds of telephones will be inaugurated which will be appreciated by all classes of subscribers. Usually when a corporation makes such a material improvement in its service as is now being effected by the telephone company in Columbus prices are advanced; and the announcement of reduction of rates will therefore be particularly appreciated by the local public. Under the new system of rates it is said business telephones will range from $2 to $4 per month, and there will be a very material reduction in rates for all residence telephones, including special arrangements for out of town or country stations. All 'phones will be long distance, and this in itself will be a great advantage.

Willis Delworth, proprietor of an independent telephone system at Beloit, Kan., was in Kansas City recently and called on a number of the city officials for the purpose of urging their assistance in securing a franchise from the city council for the Missouri and Interstate Telephone Company.

The citizens of Logansport, Ind., are asking that the New Telephone Company of Indianapolis put in a complete plant at Logansport. The company has asked for a toll franchise. It is claimed that the independent company at Logansport is practically absorbed by the Central Union, and that there is no competition.

Fargo, N. D., was recently made the exchange for thirty long distance telephone wires by the Northwestern Telephone Exchange. This will simplify the work in North Dakota and the northern part of Minnesota.

The Cumberland Valley Telephone and Telegraph Company of Jeffersonville, Ky., has begun the work of laying a conduit on Court avenue in order to meet the demand of its increased business.

The local telephone exchange which has been in operation at Belmond, Ia., for a year, was recently absorbed by the Western Electric Telephone Company. It is thought that other towns will be forced to sell out to the larger concerns.

An independent telephone company has lately been organized at Williamsburg, the county seat of Whitley County. It is known as the Whitley Telephone Company and is said to be backed by some of the best citizens of the town.

TELEPHONE INCORPORATIONS.

The Venton County Telegraph Company, Camden, Tenn.,—to construct and operate a telephone line. Capital stock, $2,000. Incorporators: G. W. Baker, H. A. Caraway, L. Caraway, W. A. Weldon, S. A. Bullock, all of Camden.

The Automatic Telephone Exchange Company, Princeton, N. J.—to operate a telephone system in and about Princeton. Capital stock, $3,000. Incorporators: Henry N. Green of Trenton, and Prof. William Libbey of Princeton.

The West Penn Long Distance Telephone Company, Pittsburg, Pa. Capital stock $10,000.

The Hardin County Telephone Company, Eldora, Ia. Capital stock $50,000. Incorporators: E. H. Lundy, J. H. Bales, Dr. C. C. Gethman, L. M. Follett and Dr. C. F. Bennett.

The Pekin Telephone Company, Pekin, Ill. Capital stock $10,000. Incorporators: James W. Barrett, John C. Mead and William A. Potts.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Adel, Ia.—Macy & Hancock will soon erect an electric lighting plant.

Alliance, O.—A municipal electric light plant will soon be erected here.

Appleton, Wis.—The Appleton Electric Light & Power Company's plant was recently damaged by fire; loss, $12,000.

Arlington, Ore.—There is a proposition before the people of this place for putting in an electric light plant.

Bellaire, Mich.—J. L. Hisley of Sparta contemplates the erection of an electric light plant at this place.

Broadalbin, N. Y.—John L. Moore, of New York, is preparing to put in an electric light plant here.

Centreville, S. D.—An entire new equipment has been purchased for the electric light system to be established here by G. Norgren, a local capitalist.

Deming, N. M.—The Deming Ice & Cold Storage Company is to erect an electric light plant here.

East Jordan, Mich.—The common council recently granted a 10-year electric lighting franchise to G. E. Anthony of Manistee. The plant is to be installed at once and lights running within 60 days.

Eddyville, Ia.—This town has decided to establish an electric light plant.

Elsinore, Cal.—This city contemplates the purchase of an electric lighting plant. Address J. D. Hoff.

Farmland, Ind.—In all probability a contract will soon be let for an electric light plant here.

Gibsonburg, O.—The Gibsonburg Electric Light Company was lately incorporated with a capital stock of $12,000.

Greenport, N. Y.—The board of trustees of this village is to open bids on July 16 for electric light bonds to the amount of $5,000. The money is to be used in the improvement of the electric lighting plant.

Kirkwood, Mo.—An election will be held July 21 to vote on the question of issuing $17,000 bonds to build an electric light plant.

Leesville, La.—The Leesville Waterworks Company has franchises for an electric light and power plant.

Neoga, Ill.—The voters of this city have decided to put in an electric light plant.

Olivet, Mich.—The people here expect to have electric lights in the near future.

Orion, Mich.—The village council is considering the project of building an electric lighting plant.

Ottawa, Ont.—The Ottawa Electric Company will erect a new electric light plant to cost about $300,000. J. W. McRae, manager.

Pomeroy, O.—The Electric Light Company is getting ready to install an entire new equipment of its power plant. The improvements will consist of the most modern up-to-date machinery of large capacity.

Rangeley, Me.—The Rangeley Electric Light & Power Company contemplates the erection of an electric light plant at Rangeley Lake.

Ravenswood, W. Va.—The council has granted to C. E. Chidester, of Parkersburg, a franchise to erect an electric light plant in this place, and contracted for the lighting of the town with 20 arc lights at $1,000 per year.

Rhinebeck, N. Y.—The articles of incorporation of the Rhinebeck Electric Lighting Company were filed a short time ago. The work of constructing the plant will begin soon.

Riverside, Cal.—Bids will be received until July 17 for the purchase of steam and electrical machinery for the electric light plant. Address C. R. Stibbens, city clerk.

Sag Harbor, N. Y.—At a special meeting of the board of trustees, C. H. Vaughn, F. W. Lister and William R. Reimann, held a short time ago, an agreement was entered into between the village and the Sag Harbor Electric Light & Power Company to furnish this place with a street lighting system.

San Francisco, Cal.—This city is considering the advisability of erecting a municipal electric lighting plant.

Toronto, Ont.—J. R. Stratton, provincial secretary, has recently completed a contract with the Hamilton Electric Light & Cataract Company for electric current for lighting the building and grounds of the Hamilton Asylum for the Insane.

Victor, Col.—The city council recently let a five-year contract to the Gold Belt Electric Company to supply the city with light.

Washington, D. C.—Col. Bingham, the engineer officer in charge of public buildings and grounds, is making arrangements for the installation of a first-class electric plant in the Washington monument. Specifications are being prepared, and the work will be hastened as rapidly as possible. He expects to have the plant installed and the new elevator in operation before the end of the present year.

Wellington, Kan.—This city has sold $14,000 in bonds for erecting an electric light plant. Work will be started at once.

Westminster, Md.—The Citizens' Water & Power Company, of which J. B. Boyle is secretary, wants to purchase machinery for an electric light plant.

STREET RAILWAYS.

Albion, Mich.—The common council recently granted a 30-year franchise to the Kalamazoo Valley Electric Street Railway Company.

Alexandria Bay, N. Y.—Surveyors are working near this village in contemplation, it is said, of a trolley line which will run between Redwood, Clayton and this place. The enterprise is a scheme of the International Electric Light Company.

Altamont, N. Y.—There is some talk of building a trolley line between here and Schenectady. Should the proposed road be constructed it would be operated both as a freight and passenger road.

Beaumont, Tex.—A committee composed of W. S. Davidson and T. W. Shepherd was recently appointed to visit Galveston and investigate the system of construction and operation of the street railway there, as local capitalists are considering the advisability of building an electric street railway in this place.

Bridgeport, Conn. — The Bridgeport Traction Company is about to expend between $15,000 and $20,000 in putting its tracks on all the lines in first class condition. The work has already been started and consists of rebonding all the tracks with copper wire. When finished, it is estimated by the officials that 50 per cent. of the current will be saved.

Buffalo, Wyo.—Local capitalists are considering the feasibility of building an electric railroad from here to Clearmont on the Burlington.

Carsonville, Mo. — A blanket franchise was lately granted to the Wellston, Creve Coeur Lake and St. Charles Electric Railway Company. The proposed route will begin at this place, thence running along the National Bridge road to a point of intersection with the St. Charles Rock road, and running through Bridgeton.

Catskill, N. Y.—William E. Stewart of Harrisburg, Pa. has been arranging the preliminaries for the construction of the Catskill Electric Railway.

Detroit, Mich.—Detroit and Windsor capitalists are behind the project for building an electric line from Windsor to Chatham. It is expected that the company will be incorporated shortly. The present intention is to commence the work of construction early next spring, but it may be begun sooner if the necessary arrangements can be made.

Easton, Pa. — The articles of incorporation of the Doylestown and Easton Railway Company were recently filed in this city. The company is capitalized at $100,000. The directors are President Harry J. Shoemaker, Samuel A. Hellyer, Mahlon H. Stout, S. J. Penrose and E. Wesley Keeler, all of Doylestown, and Joseph Leedom of Philadelphia.

Glens Falls, N. Y. — It now begins to look as if the proposed electric road between here and Warrensburgh is to become a certainty. The two most prominent promoters of the road are Hon. A. B. Colvin of Glens Falls and Joseph A. Powers of Lansingburgh.

Hartford, Conn.—The Hartford Street Railway Company is about to make six trolley line extensions, besides double tracking its old lines. These proposed lines will add nearly eight miles to the trolley service of the city.

Irondale, Ala. — Mr. A. Turpin and associates have been granted franchises and will establish an electric street car line, electric light plant, etc.

Mechanicsburg, Pa.—In view of a number of property owners refusing the right of way between this city and New Holland the Lancaster, Mechanicsburg and New Holland Electric Railway Company lately decided to build the line under the general railway law and operate it by electricity. The road is to be completed this year.

Milwaukee, Wis. — According to the statement of Manager John I. Beggs, the Milwaukee Electric Railway & Light Company will soon start the preliminary work on the construction of an electric line to Chicago, which Mr. Beggs claims will be so built and equipped that its cars will equal the rate of speed maintained by the steam railways.

Norwich, Conn.—At a recent meeting of the directors of the Norwich Street Railway Company, who represented a majority of the stockholders, all were heartily in favor of the extension of the electric road to Baltic, and authorized the building of the same.

Pasadena, Cal. — The signs point more strongly than ever to the building of an electric road between this city and Alhambra and connecting Alhambra with Los Angeles. Chief Engineer Kuhrts of the Los Angeles and Pasadena line is interested.

Penn Yan, N. Y.—The proposed electric railroad on the east side of Keuka Lake, which has been talked of for so long seems now assured.

Pittsburg, Pa.— Ground is to be broken soon for the construction of the new Evergreen electric road into Reserve township, on the Northside. Francis J. Torrance, T. M. Latimer and H. M. Davidson, who are interested in the promotion of the scheme, have their plans prepared. The line is to be four miles in length, the estimated cost of which is about $350,000.

Quakertown, Pa.—The management of the Quakertown Trolley Company announces that it is about to begin operations on the extension of the line from here to Doylestown.

Ravenna, O.—The promoters of the Portage Lakes Transit Company have the necessary consents for the construction of the proposed electric line from Bedford to this city and Kent. F. Rockfeller of Cleveland will furnish most of the capital.

Rockford, Ill.—L. G. Bastedo of Chicago, treasurer of the Illinois and Rock River Railway Company, is in Dixon to take charge of the engineering work to be done by the company on its electric road from Dixon to this city.

Terre Haute, Ind.—A company of capitalists, including several Boston men and W. P. Ijams of this city has secured franchises on five roads leading out of Terre Haute for electric railroad rights-of-way. The company has a capital stock of $800,000 and work will begin on the lines within a few months.

Whitestone, N. Y. — A petition bearing the names of several hundred residents of this place and Willets Point has been sent to the officials of the North Shore Railroad Company, asking them to extend their trolley tracks from Flushing to Whitestone.

MANUFACTURING.

Columbus, O.—The Erner Hopkins Company of this city was incorporated lately by John A. Erner, William A. Hopkins, Jr., F. R. Huntington, John M. Clark and Theodore M. Livesay, with a capital stock of $10,000. This concern will make and deal in electric supplies and construction and repair material.

Trenton, N. J.—The Arnold Monophase Electric Company was recently incorporated here with a capital stock of $500,000. The purpose of the company is to manufacture and deal in single-phase alternating current motors. Charles F. Eggleston of Philadelphia, Francis B. Lee and Nelson Petty of this city have an interest in the concern.

COMPANY MATTERS.

Dubuque, Ia. — The Home Electric Company, the Dubuque Street Railway Company and the Star Electric Company of this city have agreed to consolidate into a corporation capitalized at $500,000.

Kansas City, Mo.—The stockholders of the Kansas City Electric Light Company held their annual meeting a short time ago, and re-elected all the directors.

Long Island City, N. Y.—The board of directors of the New York & Nassau County Railway Company, recently elected the following officers: Joseph Bermel, president; P. R. Marra, vice-president; E. J. McKeever, treasurer; W. L. Woodill, secretary. The directors adopted a resolution requesting the State Board of Railroad Commissioners to set a date for a hearing upon an application for a franchise. The proposed route is from the Queensborough line near Queens to Hempstead village, and is capitalized at $150,000.

Nanticoke, Pa.—At the recent annual meeting of the Nanticoke Electric Light, Heat & Power Company, the following officers were elected; President, C. E. Stegmaier; vice-president, Dr. J. A. Bullard; treasurer, Geo. W. Beers; secretary, W. D. Beers.

POWER AND TRANSMISSION PLANTS.

Everett, Wash.—The county commissioners recently granted the Snoqualmie Power Company a franchise to transmit electric current along any of the county roads, and to engage in such other business as is carried on by an electrical power company. The franchise is granted to the president of the above company. Mr. Charles A. Baker.

Middletown, N. Y.—It is understood that New York parties have purchased valuable water rights and privileges at Eden Falls on the Neversink River, and propose to erect a large station, equipped with the latest and most improved electric machinery, and to manufacture electricity for transmission for use for power purposes to Port Jervis, this place, Monticello and Liberty.

AUTOMOBILES.

Detroit, Mich.—A party of Chicago men have been visiting the various township officers to inquire if they can secure permits to run automobiles through the townships at a high speed. The gentlemen promised that four machines, each seating 20 persons comfortably, would be placed on the road at first in order to see if the experiment would be a success.

Springfield, Mass.—Local capitalists are interested in an automobile delivery van, the invention of S. H. Barrett of this city, and a company will probably be formed here to manufacture them. Ten business men have put money into one, and a trial trip recently made proved successful.

Wilmington, Del. — The Jackson & Sharp Company recently completed for service in Washington, D. C., five new vehicles called autocarettes. They are trolley car bodies mounted on automobile running gears, and will be operated by storage batteries. In appearance they resemble small trolley cars, and are finished in the same manner. They are mounted on rubber tire wheels and will be used on the streets of the capital. In course of time they may become rivals of the trolley cars.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—July 9.						
United Traction	100	$5,000,000	$5 000,000	1¼ % Q.,	124	125
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—July 9:						
Allentown & Lehigh Val. Trac. Co.	..	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—July 9:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	105	...
Baltimore Md.—July 9:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	23	23½
Boston, Mass.—July 9.						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	8½ % S., Oct., '99.	98	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	139	140
Brooklyn N. Y.—July 9:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	229	230
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	51¾	51¼
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	8½ % Q., Jan.,	287	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884.200	2½ % Nov., '99.	320	325
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—July 9:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.—July 9						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	25	28
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	83	88
Charleston, S. C.—July 9						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—July 9						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	252	253
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	.....	10	10½
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	27	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	77	78
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	..	..
South Chicago City Railway	100	2,000,000	1,608,200	....	..	..
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	110	..
Union Traction Ry...............com.	....	1,250,000	624,900	85 %	17	18
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	64	67½
Cincinnati, Ohio.—July 9:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—July 9:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	8-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	87½
Detroit, Mich.—July 9:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—July 9:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co................pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co., $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—July 9:						
Hartford Street Ry. Co	100	$4,000,000	$200,000	3 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	..	–
Holyoke Mass.—July 9.						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—July 9.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	–
Indianapolis, Ind—July 9.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—July 9						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	..	–
Lancaster & Col. Electric Ry	....	....	87,500	....	..	–
West End Street Railway	....	....	....	....	..	–
Louisville, Ky.—July 9:						
Louisville Ry.....................com.	100	4,000,000	8,500,000	1¼ %., April.	78	79
Louisville Ry.......................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1.	110	111
Minneapolis, Minn.—July 9						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68½
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—July 9						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	260	261
Toronto Street Ry. Co	100	6,000.000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—July 9:						
Memphis Street Railway Co	100	500,000	500,000	....	25	–
New Haven, Conn.—July 9:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	–
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—July 9						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—July 9:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	270	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	178	184½
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	100	125
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900	149	149¼
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	230	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	199	201
h Eighth Avenue RR	100	1,000,000	1,000,000	....	375	425
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	395	410
j Ninth Avenue RR.........guar.	100	800,000	800,000	....	198	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	203	210
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	4[illegible]5
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	60	60
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—July 9:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	58	58½
North Jersey Traction Co	100	6,000,000	6,000,000	....	26¾	27
Rapid Transit Street Railway	100	504,000	504,000	11¼ % A.	240	250
Pittsburg, Pa.—July 9:						
Allegheny Traction Co	50	500,000	500,000	....	55	56
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	24½	24¾
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	63⅝	64½
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3.000,000	6 % A.	12¼	12½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	†3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..............com.	50	17,000.000	17,000 000	J. & J.	14	14½
United Traction Co..............pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—July 9						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass.—July 9						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—July 9.						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—July 9						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—July 9:						
United Traction & Electric Co	100	8,000,000	8,000,000	¼ %, Oct. '98	109	111
Philadelphia.—July 9						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,936,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	300,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000,000	29,980,450	....	33	8 ¼
*c*Electric Traction Co.	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr. '99	450	451
*f*Lehigh Avenue Ry. Co.	50	1,000,000	....	....	43	...
*f*Lombard & South Street Ry.	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry.	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry.	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*c*Philadelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	93	96¼
*i*Catherine & Bainbridge St.	50	....	‖400,000	6 % A—Mar., '98.	..	..
*i*Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	153	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry.	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry.	50	750,000	‖420,000	$12 share, July '98.	308¼	309
*j*Philadelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—July 9						
Rochester Railway Co.	100	5,000,000	5,000,000	....	16	17
Reading, Pa.—July 9						
j Reading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry.	50	850,000	850,000	Jan., '98.	138	...
*l*East Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	..
St. Louis Mo.—July 9						
Fourth Street & Arsenal Ry.	50	800,000	150,000	....	..	..
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR.	100	2,000,000	1,500,000	1 %, Oct., '98.	..	..
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR.	50	2,400,000	2,200,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.....com.	50	500,000	500,000	....	20¼	21
United Electric Ry.....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	69	71
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July, '99	..	..
San Francisco, Cal.—June.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR.	100	1,000,000	550,000	....	..	16
Scranton Pa—July 9						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	..	..
Springfield Ill.—July 9						
Springfield Consolidated Ry	100	750,000	750,000	....	...	..
Springfield O.—July 9						
Springfield Street Ry.	100	1,000,000	1,000,000	....	..	11
Springfield, Mass.—July 9:						
Springfield Street Ry.	100	1,200,000	1,166,700	4 % A.	207	212
Toronto Canada.—July 9						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S.	§ 100	100½
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—July 9						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	104¼	105
Columbia Ry. Co	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry.	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	15	16
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	..	..
Worcester, Mass.—July 9						
*Worcester Traction Co......com.	100	8,000,000	8,000,000	....	81	82
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb., '98.	104½	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.—July 9						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—July 9						
American Bell Telephone Co.	100	50,000,000	23,650,000	4½ % Q., Jan.	298	300
Erie Telegraph & Telephone Co.	100	......	......	1 % Q., Feb. 20,	105¼	107⅝
New England Telephone Co.	..	10,894,600	10,804,600	$1.50 p. sh. Feb	18	181
New York.—July 9						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	104	106
*Commercial Cable Co.	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q., Feb.,	112	118
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	118	123
*International Ocean Tel Co. guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan., '99.	168	174
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	8 % S., Jan., '99.	180	1'4
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99.	79½	80
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—July 9:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co.	100	......	......	....	61	66
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	79	80
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	......	......	....	94½	95
Southern New Eng. Teleph. Co.	100	8,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—July 9:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	180	180½
T.-H. Elec. Co..T. Secur., Series D.	..	......	......	....	77	77½
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	43	45
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	62½
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44	44½
New York.—July 9:						
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co......com.	..	......	......	....	82	92
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900.	180	130½
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa.—July 9						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—July 9						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	75	80
Northern Elec. Light & Power Co.	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—July 9						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	10	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	150	155
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98	100
Rhode Island Elec. Protec. Co.	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q ‡	201	202
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	181	182¾
Thomson-Houston Welding Co.	100	......	......	8 % S, Dec. 1, 98.	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—July 9:						
American Electric Heating Co.	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 26, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.—July 9:						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	......	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co.........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—July 9						
Electro Pneumatic Trans. Co.	10	1,500,000	......	--	2½	3
United Gas Improvement Co..scrip.	50	10,000,000	......	--	..	162
Welsbach Commercial Co.....com.	100	8,500,000	......	--	22	28
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	42	44
Welsbach Light Co., Canada.	5	500,000	......	....	1¼	1½
Pittsburg, Pa.—July 9						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—July 9						
*Barney & Smith Car Co.......com.	100	......	1,000,000	--	14½	17
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	104	107
Billings & Spencer Co	25	......	......	....	32	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	60	62
Johns-Pratt Co	100	....	....	--	105	109
*Pratt & Whitney Co.........com.	100	......	....	--	2	4
*Pratt & Whitney Co...........pfd	100	......	......	--	40	50
Stillwell-Bierce Co..........com.	..	....	....	--	..	50
Stillwell-Bierce Co...........pfd.	..	....	....	2 % Sept 1, '99.	70	65
Shultz Belting Co	100	800,000	....	....	30	90
St. Charles Car Co	-	....	....	......	30	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	*117½	119⅜
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR.1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‡Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,080	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
†Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co...... 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅜	......
†Bal. Trac. Co.No. Balto div.1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅜
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M.& N.	104⅜	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—July 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
†Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1908	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108⅜	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅜
North Chicago St. RR........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O

Date of Quotation—July 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅜	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅜	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	182¾	187

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
*a*Brooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106⅜	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114⅜
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry.Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	......	......
*a*East Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry.1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Juyl 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	.....
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M& N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M& S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—July 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR............1st mtg. 6s	......	50,000	1899	M. & N.	105⅜	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—July 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn).1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅜	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave..........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105⅜
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface...........2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98⅜	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	930,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅜	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry ....Deb. 5s.	800,000	800,000	1909	J. & J.	108⅜	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	....	110⅜	112⅜
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—July 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry.......................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s.	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s.	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s.	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co.................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	....	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—July 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,000,000	1934	J. & D.	......	...
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	...

Providence R. I.

Date of Quotation—Juyl 9, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	114	118

St. Louis.

Date of Quotation—Juyl 9, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101⅜	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s.	1,818,000	1,818,000	1912	J & J	101⅜	102⅜
Citizens' Railway Co.......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J& J	17	118

*With interest

PASSENGER RAILWAY.

St. Louis.

Date of Quotation— July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co........................1st mtg. 5s	1,500,000	1,500.000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co.....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation—June, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117 *
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117 *
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000.000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation—July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co.......................Cons. mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry...........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

Miscellaneous.

Date of Quotation—July 9, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	8,000,000	2,866,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	....	......
St. Paul City Ry...................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105¼	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.

Date of Quotation— July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation— July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......

Miscellaneous.—(Juy 9, 1900.)

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	......	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	[illegible]	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000		1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	[illegible]	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation—July 9. 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Bell Telephone......................4s.			1908	F. & A.	100⅛	101
Northwestern Telegraph Co..................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—July 9, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating ....7s.	500,000	500,000	....	......	....	......
Armington & Sims Engine Co................	....	....	......		......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co..............................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16⅛@16¼c.; Lake, 16¼@16½c.; casting, 16@16⅛c.

Business failures in the United States in the first half of 1900 comprised the smallest number in eighteen years.

The Easton (Pa.) Consolidated Electric Company reports gross earnings for May as $21,216 and net earnings as $6,787.

The Whitney-Widener-Elkins syndicate has consolidated all the traction interests in St. Lawrence County, N. Y.

The Chicago Union Traction Company has declared a dividend of 1½ per cent. on the preferred stock, payable July 20.

Foundations have just been completed by the United Railways & Electric Company, of Baltimore, Md., for some very extensive repair shops in that city.

The Erie Telephone management claim a net gain of 2,744 subscribers in June. Total number connected June 30, 126 455. Number waiting connection 6,073.

The Edison Illuminating Company of Detroit, Mich., has filed a notice of the increase of its capital stock from 30,000 shares of a par value of $750,000 to 36,000 shares of a par value of $900,000.

Justice Herrick at Albany has issued a writ of certiorari directing the State Board of Tax Commissioners to review their assessments under the franchise tax law upon the lines of the Metropolitan system of New York.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 16@18; New York Electric Vehicle Transportation, 5¼@6¼; New England Transportation, 3¾@4¼; Gramophone, 35@40.

The Consolidated Traction Company of Pittsburg, Pa., has awarded a contract for 42 miles of feeder cables. The new cable will be used largely to supply current for the operation of several extensions now under construction.

Elmer Wilson, of the Niles (O.) Electric Company, is securing the right of way for an electric railway between Niles and Salt Springs, where a hotel and sanitarium are to be built. The same company proposes a line to Warren and Youngstown.

It is reported that the Augusta (Ga.) Railway and Electric Company have secured a new mortgage for $1,000,000 with the Mercantile Trust & Deposit Company as trustee. The new issue will retire the old bonds outstanding, and provide for extensive improvements.

The Massachusetts Board of Railroad Commissioners has granted the petition of the Boston Elevated Railway Company for the additional issue of capital stock to the amount of $9 500,000; $3,100,000 is to be applied to construction and equipment of the elevated structure of the railway, including foundations tracks and electric system.

The statement of earnings of the Metropolitan system of New York for the month of June was made public on the 8th inst. It showed a total of $1 237,580, as compared with $1,198 800 in June of 1899. This completes the Metropolitan's fiscal year, and shows the total earnings for the year to be $14,249,050, an increase over the preceding year of $1 535 815.

The Economy Light and Power Company of Joliet, Ill., has given a trust deed to the Illinois Trust and Savings Bank of Chicago for a period of fifteen years, in the sum of $300,000, embracing 300 bonds of $1,000 each. The mortgage covers all the real and personal property of the company. The first mortgage coupon bonds are dated June 1, 1900, and are payable to bearer June 1, 1915. They bear interest at the rate of 5 per cent. which is payable semi-annually. Both interest and principal are payable in gold coin.

According to the "New York Journal of Commerce" the recent predictions of copper producers that buyers would enter the market during the current month appear to be already meeting with confirmation. A perceptible increase in the number of inquiries is reported, and there has also been some improvement in the amount of actual business. Some sales of copper have been made at 16 cents up to the end of the current year, and it is the expressed opinion of some sellers that the price will not go below that figure during the coming six months.

The Consolidated Traction Company, which owns the trolley lines between Jersey City and Newark, recently ordered a second semi annual dividend of 1 per cent. paid to its stockholders. The first dividend was paid last January. The Consolidated is leased by the North Jersey Street Railway Company, and the latter under the terms of the lease last week paid to the Consolidated $150,000. This money will be used to pay the dividends July 15. Next January the North Jersey will pay another $150,000 to the Consolidated Traction Company, and the latter will pay another 1 per cent. dividend with it.

A special meeting of the stockholders of the General Electric Company will be held July 17, at Schenectady, to vote on the proposition to increase the capital stock by $4,415,000 to retire outstanding debenture bonds. The suggestion comes from Wall Street quarters that the company offers the new stock to present shareholders at par. It is figured that the rights would give shareholders about 20 to 25 per cent. on new stock at par, equivalent at present prices to a dividend of about 7 per cent. It is further suggested that this would be nothing more than doing right by stockholders, inasmuch as out of earnings aggregating some 25 per cent. in 1899, stockholders received only 6 per cent. and the business so far for 1900 is acknowledged to be fully holding its own.

A plan has beeen consumated to consolidate all the electric and gas lighting interests in Queens Borough (N. Y.) into one company. The negotiations are being conducted by Wilson & Stephens of 41 Wall street. The only company which will not be included in the deal is that at Far Rockaway. It is understood that the purchasing company intends to concentrate all its interests in one vast lighting enterprise to cover the borough of Queens, which has the largest area of any borough in New York. A mammoth power-house is to be built from which the current will be sent all over the borough, and which will be run at much less cost than the numerous power houses in the territory. The company will also do private business, providing electric light for houses, and it is also intended to supply electricity to private families for cooking purposes.

The publication of an alleged statement of the earnings of the Brooklyn Rapid Transit Company caused a sharp break in the stock yesterday, declining from the high figure of 56⅛ to 50¾, and closing at 51¼, a net loss of 4⅞ points, on sales of approximately 70,000 shares. Vague rumors were heard that developments in the affairs of the company that would not be regarded as altogether favorable were pending, and these tended for the time being to check speculation in the stock. Later these promised developments took definite form when what purported to be an advance statement of the earnings of the system for the year ended June 30 was put out by several news agencies. This statement showed gross earnings of $11,200,000, operating expenses of $7,168,000, net earnings of $4,032,000, and other earnings of $400,000, making gross income $4,432,000. Charges and taxes for the year amounted to $4,201,000, leaving a net income of $231,000—less than enough to pay the estimated tax of $400,000 under the Ford franchise law, should that law be enforced.

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ELECTRICITY.

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EDITORIAL NOTES.

The Electrical Congress of the Paris Exposition.

The International Electrical Congress at Paris, which will be held from August 18 to 25, will bring together in the French metropolis noted scientists from all parts of the world, eager to take part in the discussions of the latest inventions and discoveries.

The Electrical Congress is only one of many that will be held. The congresses as an adjunct to the Exposition have been made a recognized part of the latter, to the extent that each country has been requested, through its commissioner general, to designate two or three persons for each congress. These will be known as the official delegates from their respective countries. This does not absolutely limit the representation from a country to the number mentioned. Local and national organizations may send delegates, but the actual work of each congress will be assigned to official delegates. So great is the interest manifested in the congresses, and so palpable is its connection with the material features of the Exposition, that all who desire to receive the benefits of the meetings may become members on the payment of a small fee (20 francs).

The Electrical Congress will consist of five separate and distinct sections in which the following general subjects will be discussed: "Scientific Processes and Measuring Instruments; Production of Electrical Energy; Electro Chemistry, Telegraphy and Telephony, and Electro-Physiology." These general heads will again be subdivided. Under the first, topics such as "Magnitudes and Units, Methods of Measurement, Measuring Instruments, and Photometry," will be dealt with. In section two "Transmission and Distribution, Electric Traction and Lighting" will be treated. Under Electro-Chemistry various types of apparatus and the electrolytic treatment of ores of copper, zinc, lead and nickel, besides many special applications will be described. In section four, the many types of batteries in use for telephone purposes, besides overhead and underground line construction will receive the attention of the delegates. In this section the subject of submarine telegraphy and telephony as well as wireless telegraphy will also be brought up. In the section devoted to Electro-Physiology, the production of electricity by living beings, as well as the action of electricity on living beings, will be gone into. In addition to these, measures to be adopted with persons suffering from electric shock will be suggested.

While the Congress is in session, the delegates will be afforded an opportunity of visiting the principal electrical plants and installations in the vicinity.

The bringing together of such an intellectual body of men, each a specialist in some department of electrical engineering, should be the means of ultimately giving to the world at large much valuable information regarding new devices and theories.

* * *

Trolley Lines as Freight Carriers.

A few years ago it was an unusual thing for a trolley road to carry freight of whatsoever nature, while now reports from all over the country would seem to indicate that trolley companies are beginning to realize that large profits may be obtained from traffic of this nature. Last winter the running of express cars in Brooklyn by an express company caused some legal complication, the court finally deciding that according to the general railroad law of 1890 a trolley company had a perfect right to transport express matter if it so desired. On the strength of this decision arrangements are now on foot looking to the organization of a trolley freight line in that borough with a capitalization of $1,000,000. The company expects its cars will be in service by winter and proposes to secure privileges for moving ashes, stone and earth for the city, and for carrying coal, sugar, lumber and other freight for firms and individuals. The Brooklyn Rapid Transit Company is said not to be interested in the project, except that it will receive compensation for the use of its lines and power. Interests identified with the company, however, are believed to be back of the scheme.

But this is not the only State in which it is proposed to utilize trolley lines as freight carriers. In Michigan a road is about to be built between Saginaw, St. Charles and Durand, which, as it passes a number of coal mines, will incidentally convey fuel from one point to another. By this means it is claimed that the cost of hauling will be slightly reduced as against the present rates charged by the steam road. The trolley line in question will

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also be used for hauling sugar beets from the farms along the line to the factories.

In northern Illinois a similar road is projected, while in other parts of the country trolley roads are beginning to compete—on a limited scale as yet—with steam roads as freight carriers. This condition of affairs is causing some uneasiness in steam railroad circles, so much so that Mr. Cicero J. Lindley, of the Illinois Railroad and Warehouse Commission, in an address before the National Convention of Railroad Commissioners in Milwaukee suggested the placing of electric lines under the control of a commission similar to that of the steam roads.

Looking at the matter from an unprejudiced standpoint, there would seem to be no valid reason why trolley roads should not carry freight, providing of course it does not interfere with the transportation of passengers. That railroad officials should feel more or less anxious and annoyed at this new departure is only natural, for in time it cannot help but affect the business of some of the railroads, especially in the line of farm products.

It should also somewhat tend to hurt express companies. But on the other hand the carrying of packages and light freight by trolley companies might, as we have previously stated in these columns, prove of benefit to the general public, where a road runs from a thickly settled community out into the suburbs. With such a road the carrying of freight would unquestionably be of advantage to commuters, and would to a great extent obviate the filling of a passenger coach with bundles of all sizes and shapes.

Another advantage of a trolley freight carrying system, such as that suggested for Brooklyn, is that it should tend to reduce the number of drays and trucks on the street, which would be a most welcome innovation, especially to the public of New York City.

* * *

Trial of a Huge German Airship. In the issue of ELECTRICITY of November 15, 1899, we referred in these columns to an airship that was being built at Manzell on the Lake of Constance in Germany, which surpassed—at least in point of size—anything yet attempted in the aerial navigation line. This airship has now been completed, and was given a trial last week, which, if advices from abroad may be relied on, was most successful in every particular.

This problem of devising a suitable structure capable of traveling through space has gradually become an important one, well-known inventors in all parts of the world having been at work on it for some time.

The prize offered by an enthusiast on this subject, to be competed for at the Paris Exposition, has further tended to stimulate interest in this method of propulsion, with the result that, figuratively speaking, thousands of eyes are being directed toward the experiments that are being carried on with the immense airship built under the direction of Count von Zeppelin, at Manzell-am-Bodensee.

As we have several times stated when referring to this subject the greatest difficulty to be overcome in an enterprise of this nature lies not so much in the inability to raise a weight from the earth as in properly guiding the airship in its course through space. Whether this heretofore apparently insurmountable obstacle has been successfully overcome in the Zeppelin airship is not clearly set forth in the report at hand. From the fact that the experiment had to be postponed a day owing to "an unfavorable west wind," it is to be inferred that the inventor and his assistants had their doubts as to whether it could be guided in the desired direction. As it was on the day of the initial trial the structure containing five persons traveled without accident from Friedrichshäfen to Immenstadt, a distance of about fifteen miles.

The airship, which has a length of over 500 feet and a diameter of 37 feet, is made up of seventeen independent balloons, contained in a skeleton structure, and is propelled by means of powerful benzine motors, which are located in aluminum gondolas suspended below the structure. These motors operate air propellers situated beneath the front and rear ends of the carrying body. The explosions in the motors are brought about in the usual way by electric sparks, the power generated being transmitted to the propellers through steel tubes. The air vessel is capable of lifting a weight of ten tons, and the inventor confidently expects be able to travel at a rate of speed of twenty-two miles an hour.

Great secrecy has been maintained as to most of the details of construction of the airship, it being to a certain extent a Government enterprise, inasmuch as it is understood considerable sums of money have been advanced by the German Government. If the device proves a success after an extensive trial it will no doubt be looked upon by Emperor William as a powerful weapon of warfare, by means of which, if occasion required, cities could be dedestroyed and country laid to waste.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

MR. CARL HERING has been named vice-president of the jury of the Electrical Class at the Paris Exposition, and also vice-president of the jury of the group in which this class is included.

CARS are running regularly on all the Transit Company's lines in St. Louis.

DR. LOUIS DUNCAN has been selected as chief engineer by the directors of the Keystone Telephone Company of Philadelphia.

THE conductors on the Metropolitan Street Railroad Company, Washington, D.C., threaten to strike because of the inaccuracy of the cash registers.

AN economical change from steam to electrical power is to be made at the Norton Brothers' slate quarries on Briar Hill, Granville, N. Y. They will start in with an eighty horse power motor and if it works satisfactorily their entire plant, requiring upwards of 200 horse power, will be operated by electricity. For this purpose another large and more improved dynamo will be put in.

U. S. CONSUL HUGHES, in a report to the State Department in regard to electric cartridges, says: "An Italian electrician has invented an electric cartridge, which he offers as a substitute for dynamite and smokeless powder in mines, rock blasting, and for heavy ordnance. The composition used in the cartridge is made up of carbonates of potash and chloride of ammonia, the proportion varying according to the use. The discharge is affected by an electric spark, which produces electrolytic effects upon the chemicals. The inventor claims that the cartridges, until subjected to the effect of electricity, are entirely inoffensive and perfectly safe; so that there will be no necessity for isolating the magazines where they are stored."

AMONG the features of "The Greater Interstate Fair," to be held at Trenton, N. J., September 24-28, will be an automobile exhibition and automobile races. No charge will be made for space for exhibiting automobiles and their accessories. The automobile races, of which there will be five, will take place September 24. The course will be from five to ten miles. The prizes will be $100 in three races, $200 in the fourth, and a cup in the fifth race.

ACCORDING to news received from London, in the House of Commons on the 12th inst., the Secretary of State for the Colonies, Joseph Chamberlain, announced that tenders for laying the Pacific cable would be invited immediately, the Government of Canada and the various colonial Governments interested having accepted the recommendations of the committee.

A DEAL involving $2,000,000 and financed by a Cleveland trust company, is under way for the formation of a syndicate to operate the electric transportation systems in six of the largest cities in Mexico. The headquarters will be in New York.

WILLIAM H. JAKWAY, M. S., formerly an instructor in the department of physics at the Syracuse (N. Y.) University, and now an X-ray expert, has completed a Wehnelt electrolytic interrupter, an electro-chemical contrivance for breaking electrical currents, and gave a successful exhibit last week. The contrivance was first used on direct currents and latter was found to work on alternating currents. On direct currents it takes the place of a mechanical vibrator on induction coils, particularly in use with cathode ray machines. By its use an alternating current may be used to run X-ray machines and not clog or dim the Crookes tubes. The contrivance was invented a year ago and Mr. Jakway succeeded in making one from a brief written description.

AN attempt has been on foot to arrange between the powers now operating in China for an international cable connecting the base of Chinese operations either with Shanghai, Port Arthur, Yokohama, or some other point through which more speedy communication can be had with the outside world. The State, War and Navy Departments have all been parties to the conference, which has been conducted with a great deal of diplomatic secrecy. Both the War and Navy Departments have been figuring for months on a trans-Pacific cable, and consequently have all the necessary information at their fingers' ends. The War Department now has fifty miles of cable ready o ship to Manila, to be followed by 400 miles more about August 1. This was to be used for inter-island communication in the Philippines, but the urgency of the case may cause it to be diverted to China. No point has yet been decided on for either end of this international line, Che Foo and Taku both having been

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discussed for the Chinese terminus. It is 600 miles by water from Taku to Shanghai, the terminus of the British cable. It is less than 100 miles from Taku to Port Arthur, but the Russian land lines both in Korea and Manchuria have been subject to such serious interruption as to almost bar the consideration of this route for the international connecting link. The expense of this undertaking, according to the present tentative arrangements, will be borne jointly by the powers interested. It is impossible at present to give a fair estimate of the time that would be consumed in carrying out the project, but it is probable that the United States is in position to do the work more quickly than any other nation.

SUPERINTENDENT PATTERSON of the New York division of the Pennsylvania Railroad has convinced himself by practical tests that the telephone is handier than the telegraph in communicating with his men along the line. He has a telephone instrument in his private car and whenever he desires to communicate with any place on the line the car is stopped, a lineman quickly makes a connection with the wires along the side of the track and a conversation can be had in less time than it would take to send a "rush" telegraph message and get an answer.

ELECTRIC lights and electric fans add much to the pleasure of traveling on railroad coaches, and the Canada Atlantic Railway has commenced installing such on their passenger cars. Mr. M. R. Shedd, of the Gould Electric Car Lighting Company, of Depew, N. Y., is in Ottawa installing the necessary plants on the cars. The dynamos used hang under the car and have belts attached to the axles, and are double system storage batteries. The Governor-General's car, "Victoria," has been equipped with the lights and fans.

A MEASURE designed to prevent electrolysis on the water pipes and conduits of Chicago has been recommended to the city council for passage by the committee on judiciary. The measure prevents the telephone and telegraph companies from laying wires around or wiring close to the water pipes. It was framed by City Electrician Ellicott, who says great damage has already been done to the city water mains.

A NUMBER of the big trunk lines, among them the New York Central and the Lackawanna, are making experiments with a new method of lighting cars by electricity. By this system the electricity is generated by power furnished by the revolutions of the axles of each car, for each of which a separate storage battery is provided in which the electricity is stored. The advantages of this system over oil lamps and gas lighting are said to be its safety in case of collisions, preventing explosions and the setting on fire of wrecked cars. It also does away with extensive plants for the generating of gas, such as are necessary under the Pintsch system. According to a recent statement electric light by car-axle power is to be the system of the future.

C. H. STORMS, electrician for the Rapid Transit Company of Waterloo, Ia., has invented a block alarm system, which is now in use by the company. When a car passes a switch it lights an electric light at the next switch, which remains lighted until the line is clear. It prevents delays by overdue cars, as it is always a guide as to whether or not the track is clear.

THE London "Electrician" says it is informed from a reliable source that there is a likelihood of an amalgamation taking place between the two big German electrical undertakings of Siemens & Halske and the Allgemeine Elektricitäts-Gesellschaft. This is not very surprising, as they both work with very large capital, and are really to a great extent only competing between themselves. The former firm has quite recently erected enormous works at Nonnendamm, which is near Berlin, and, in fact, the works had to be built near a large town or city, as they give employment to over 6,000 workmen and officials, and the question of the housing of this number had to be considered. The whole of the property which has been acquired has not yet been built over, as the company intend at a future date to remove their dynamo works from Charlottenburg, and plans are in preparation for the works to be built for this purpose at Nonnendamm.

THE first street railway convention ever held in England closed recently, and our London correspondent says that "Englishmen are at last becoming just a wee bit Americanized in the matter of electric traction."

THE tenth annual meeting of the American Electro-Therapeutic Association will be held on September 25, 26 and 27, at the Academy of Medicine, in New York City. Among the other features of the convention will be two interesting discussions: 1. "Electricity in Gynecology and the present Reluctance of Gynecologists to use Electricity." 2. "Electricity in Tuberculosis and the Present Modes of Treatment." Dr. Walter H. White of Boston, is the president.

IN a paper read before the Société Physico-Chimique Russe, and abstracted in a recent number of the "Journal de Physique," a method is developed by M. Boulgakoff for calculating the value of a tore of certain dimensions. For a surface generated by the revolution of a disk 3 cm. diameter, whose center describes a circle of 30 cm. radius, the capacity was calculated to be 10.8253 electrostatic units. Careful measurement gave, experimentally, the value 10.82, thus conclusively justifying the accuracy of the method of calculation. It is shown as a deduction from the experiments, that a value for v can be obtained which does not exceed 3×10^{10} cm. per second by as much as $\frac{1}{1000}$th.

A GOOD deal of interest attaches to electrical affairs in the East just now; therefore it is worth quoting from the "Hong Kong Daily Press" that the Canton Electric Lighting and Fire Extinguishing Company, Limited, has just held an extraordinary general meeting. Among those present were Mr. Fung Wa Chuon, who presided, and Messrs. Lil Tze San, Tam Tsz Kong, Li Yuk Tong, Lo Ki, Tam Wai Tong, Chan He Wan, Liao Fung Shu, Fung Hi, Lam Yuk Ling, and Pun Tsz Seung. The chairman, Mr. Fung Wa Chuon, proposed that the company be wound up voluntarily. Mr. Tam Tsz Kong seconded, and the motion was carried unanimously. On the motion of the chairman, seconded by Mr. Lil Tze San, Mr. Li Yuk Tong was appointed liquidator. In the absence of a reason for this liquidation, we are left to our own imaginings to ascribe a cause!

THE EFFICIENCY OF THE STEAM ENGINE.*

BY E. C. DE SEGUNDO, A. M. I. C. E.

The steam engine and boiler have been brought to a degree of efficiency upon which there appears to be little room for improvement. There are authentic cases of boilers in which 85 per cent. of the heat energy of the coal consumed reappears in the steam raised. The Carnot efficiency of the steam engine itself has been brought to nearly 28 per cent., and the mechanical efficiency to 95 per cent. It may fairly be assumed that steam pumping plant can now be designed which will work at an absolute efficiency of $0.85 \times 0.23 \times 0.90 = 17.6$ per cent., that is to say, that 17.6 per cent. of the heat value of the fuel will reappear as available mechanical work done by the engine. At first sight this does not appear to be a brilliant result, though, when analyzed, it will be found difficult to improve upon in the present state of our knowledge. The main source of wasted energy is, of course, in the loss of the latent heat of vaporization of water. Although 966 thermal units must be expended in converting a pound of water into a pound of steam at atmospheric pressure and 212° F., this heat is lost as far as conversion into mechanical energy is concerned. It is the price nature makes one pay for the privilege of being able to convert water into steam, and so utilize its expansive characteristics, and so far every effort to turn this 966 thermal units per pound of steam to account has failed.

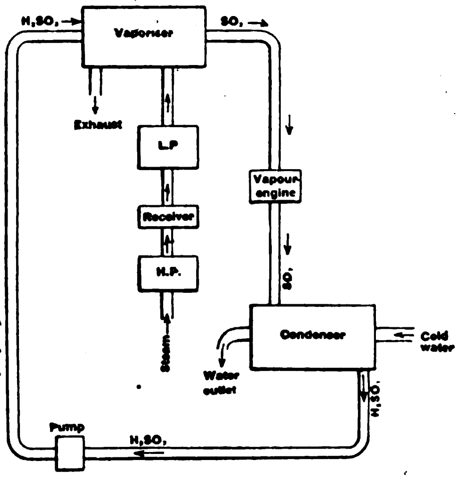

FIG. 1.

The question that naturally rises to one's mind then, is whether it would not be more practical to use steam gas and not saturated steam for the purpose of the steam engine. Unfortunately, however, nature has some very good reasons why this should not be carried out practically, and the price that she exacts for using steam as a gas is even higher than before. Steam engine builders have attempted to meet nature half-way by superheating steam to some extent on its way from the boiler to the engine, and very marked economy has been attained in this way, but nothing like the saving that would be effected if the latent heat of vaporization could be utilized. An interesting attempt to convert the latent heat of vaporization into mechanical energy has been made by G. Behrend, of Hamburg, and Dr. Zimmermann, of Ludwigshafen, who have jointly worked out the details of an engine, the general arrangement of which is shown in diagram in Fig. 1. The engine was described by

* From the "Electrical Review," London.

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Prof. Josse at the recent centennial anniversary of the Royal Technical School at Charlottenburg. It is a compound engine indicating 34 hp. with a consumption of steam of 18.96 lbs. per ihp. per hour. The steam from the low pressure cylinder passes into a vaporizer which is practically a surface condenser, in which H_2SO_3 in passing through the tubes is converted into SO_2 by the heat of the exhaust steam from the low pressure cylinder circulating round the tubes. The SO_2 then passes to the auxiliary engine, as indicated by the arrow, where it does work, and then flows to the condenser, where the SO_2 becomes H_2SO_3 by contact with the cooled surfaces of the tubes. Thence the H_2SO_3 is pumped back to the vaporizer.

The auxiliary engine in the combination referred to by Prof. Josse, indicated 19 hp., being an increase of horse-power per pound of steam consumed of 56 per cent. In other words, 18.96 lbs. of steam per hour would now correspond to 1.56 hp., or 12.13 lbs. steam per ihp.-hour.

Experiments showed that for every 33.169 lbs. of steam passing through the main engine, 1 hp. was developed in the auxiliary engine.

If the temperatures between which the SO_2 vapor works be 140° F. and 67° F., the pressure would be between 147 lbs. per square inch, and 34.5 lbs. per square inch, hence pressures equal to boiler pressures are readily obtainable.

The Carnot efficiency would be about 26 per cent., that is to say, the engine would theoretically be capable of turning 26 per cent. of the heat supplied to it into work. As it yielded 1 ihp. for one hour, for 12.13 lbs. of steam, it turned into work nearly 18 per cent. of the heat supplied, hence the relative efficiency of the combination, roughly estimated, would be

$$\frac{18 \times 100}{26} = \text{nearly 70 per cent.}$$

This is not so good a result as that obtained from a quadruple expansion pumping engine set up at a station of the Pennsylvania Water Company, near Pittsburg, and which was tested by Prof. Thurston in September, 1898. The efficiency of this engine measured against the perfect engine of Carnot was 84 per cent.

In this latter case the increase of efficiency was obtained mainly by the elaborate system of feed water heating introduced, and while no doubt, applicable with success to a slow-speed engine such as the one referred to, it is not likely that the principle could be successfully carried out in connection with steam engines of the ordinary commercial type, or with high-speed engines. The suggestion of an SO_2 vapor auxiliary engine is therefore interesting, in that it effects what all attempts at increasing the efficiency of the steam engine aim at, namely, an increase in the range of the temperature through which the working fluid passes by lowering the lower temperature.

As far as can be gathered, this SO_2 auxiliary engine has not yet taken a practical form. Possibly trouble may be experienced by the formation of H_2SO_4 during the cycle, which would, of course, be disastrous. Possibly, also, the extra space required, and the necessary duplication of all the essential parts of a steam engine, have been found to introduce more complication and involve greater disadvantages than are counterbalanced by the increase of power obtained.

Syracuse, N. Y., is about to dispose of the last horse car line in that city. Nearly all the roads are now run by electricity.

PARIS EXHIBIT OF THE HELIOS COMPANY.

BY FRANK C. PERKINS.

The engine and dynamo exhibited at the Paris Exposition in the Palace of Electricity by the Helios Company are well worthy of attention. The largest of these alternators that have been furnished so far are those for the electric central station of Cologne, having each diameter of 8 meters or 26 feet. Six alternators of this type direct connected to their prime movers are shown in Fig. 1. The Paris alternators weigh 50 tons each and operate at 2,200 volts at 70 revolutions per minute. The total distance from the lowest point of the foundation to the top of the generator is 13 meters or about 44 feet.

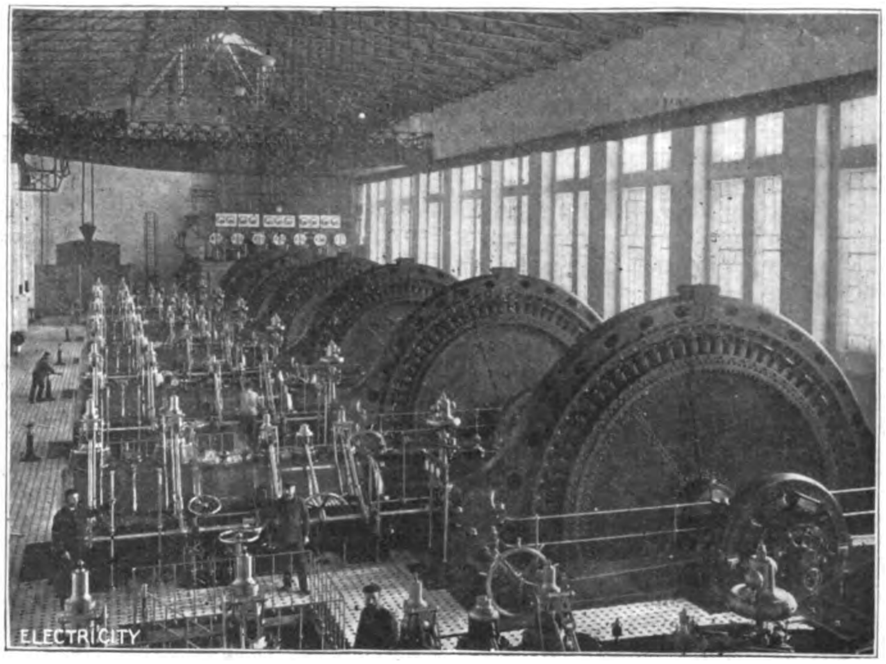

FIG. 1.—HELIOS ALTERNATORS WITH REVOLVING FIELDS.

Near the engine and dynamo there is placed the continuous current dynamo, Fig. 2, serving for the excitation of the poles of the large dynamo. This exciter represents the modern form of continuous current generators, and is, like the large alternator, coupled directly to a steam engine, in different ways however, as the large dynamo. Several small dynamos have been placed in the neighborhood; they are not at work. The same may be said with regard to some electromotors for three-phase current and for continuous of this current. Several iron-clad motors specially constructed for wet rooms are shown opened and closed: they have so far given full satisfaction under the most trying circumstances. The principal feature of these motors is their high starting torque. The main part of the Helios exhibition of three-phase (Drehstrom) motors and transformers is working in several places in the large machine hall; the visible part of the exhibition only contains two alternate current transformers of 5 and 25 kilowatts output of the type first used for St. Petersburg.

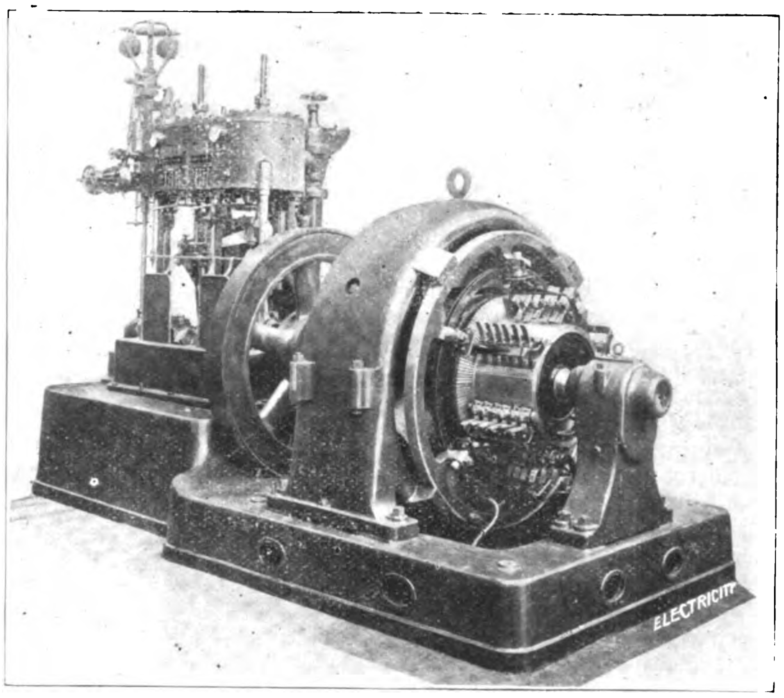

FIG. 2.—HELIOS DIRECT CURRENT EXCITER AT PARIS EXPOSITION.

At the wall there is fixed one of the Helios alternate current meters provided with the

latest improvements and representing one of the best known types of meters. Aside of it, there are two test curves showing the correctness of the meter for different loads, and two models of the peculiar systems of lighting that have been employed by the Helios Company for the illumination of the Kiel, or Kaiser Wilhelm Canal and of the city of Rosenheim in Bavaria. Another interesting group is that containing modern switchboard devices, whose construction has required a considerable amount of labor, experience and attention in order to make them precise, reliable and strong.

ADVANTAGES OF RECORDING WATTMETERS ON SWITCHBOARDS.*

BY W. WORTH BEAN.

For the past three years watt recording meters have been used on the switchboards of the St. Joseph & Benton Harbor Electric Railway & Light Company, and the following advantages may be summed up from their use:

In the first place it enables the central station manager to make contracts with the coal dealers and mine owners in an intelligent manner, because the output from the station in kilowatts is shown every twenty-four hours, thereby giving each grade or quality of coal an equal test. No coal dealer can laud the virtues of his coal above that of his competitor. It puts at rest all vague statements concerning the quality of the coal, making it stand upon its actual merits and tests, and showing to the central station manager whether it is best to use mine run, screen lump or slack, and proving which can be used to the best advantage in each particular station.

Next, the fireman understands before using the coal that the meters on the switchboard are going to give actual results of his firing, making superfluous any statements of the fireman with regard to inferior coal or heavy loads.

It will further show that the employe who produces the best results with the least amount of coal consumed, is the one who should draw the most money. Then give the proper fuel and firing, a test for engines is necessary in order to show that the engineer is not responsible for any possible waste.

The electrician must see that the proper speeds in his generators and dynamos are kept up by having a sufficient steam pressure at all times, the engineer furnishing it to him for the varying loads. Then with the proper connections from machine to switchboard, current is furnished at the most economical price to the meter. The given amount of current leaving the switchboard being known to the station manager, he is enabled to tell if his current is wasted in motors, transformers, lamps or wire connections.

A further advantage to be derived from meters, would be to have all central station switchboards equipped with them, where records could be taken monthly, and comparisons made with plants in that locality for the purpose of showing still greater economy, if possible.

I consider the meter on the central station switchboard a most indispensable instrument, because properly looked after it is conducive to the greatest economy in fuel, in firing, in engine and dynamo, all of which combined will produce the necessary economy at the meter.

* Paper read at the Northwestern Electrical Association Convention, Waupaca, Wis., June 26-28, 1900.

The cost of meters is a mere bagatelle as compared to the saving in coal alone.

After my experience with them, I would strongly advise that all central stations adopt meters on their switchboards for their own advantage and economy.

DISCUSSION.

Mr. W. B. Baker of Waupaca—What is the usual discrepancy between the wattmeter on the switchboard and the combined wattmeter on the system?

Mr. Bean—Our plant is a combination plant, and we are cursed with flat rates, as well as having meter rates, and I could not give you a proper answer to your question, because part of my current goes to a flat rate load, and part to a meter rate load.

Mr. Baker—Under those circumstances then how would you detect a loss on your line?

Mr. Bean—That can be detected, but the important thing is to get the current started out of the station in an economical manner.

Mr. Baker—Do you know of any station that is using meters with its customers, and also using a wattmeter at the switchboard? And if so, what is the usual percentage of difference?

Mr. Bean—I do not know personally. Our plant is a combination, railway 500 volts, motors 500 volts, alternating current and distributed from one city to another, and incandescent, alternating arcs and old multiple arcs and series, and long-burning arcs. That is our combination plant and to give the difference between the station switchboard wattmeter and the customers' wattmeters would be exceedingly difficult.

Mr. Baker—Do you employ the wattmeter on your railway system too?

Mr. Bean—Do you mean on each car or on the switchboard?

Mr. Baker—On the switchboard.

Mr. Bean—I use a wattmeter for every machine in the station. I have a 50 T.-H. machine, a 75 T.-H. machine, 120 Brush machine, all arc; one 1,000 alternator, two 2,000 alternators, three 250 compound-condensing engines. Two engines are connected to the line shaft 57 feet; one of these engines on the end of the line shaft is connected to an M. P. 90 generator old type, and one 225 kw. generator new type, 425 revolutions, and a meter for each circuit is on the switchboard, showing the output in current from the station.

Mr. F. A. Copeland of La Crosse—The plant with which I am connected keeps the output in amperes at the station, and we also have the record on consumers' meters. We have a few contracts and have a meter on them also, so that we know the exact amount of current that we put out, and the exact amount of current that we receive pay for. The loss will run anywhere from 20 to 35 per cent. Our loss averages about 27 per cent., which is, I believe, a fair average showing. As I understand it, we meter everything, whether on contract or not. So if a man is on contract we know just exactly what he is using. We have no recording wattmeter at the station. We keep it the old-fashioned way by putting down the number of amperes every 15 minutes, and come pretty close to it that way. We do not get it perfectly accurate but pretty close.

Mr. Bean—Do you use direct current?

Mr. Copeland—Yes; the Edison three-wire system, all of it.

Mr. Bean—No railway or generator?

Mr. Copeland—No railway and no series arc lighting.

Mr. Bean—A railway generator will be running along at 50 amperes and perhaps in minutes will jump up to 400 or 500 amperes. This talk of mine is simply a personal matter with me. I merely want to get the experience of the other members, and I am not prepared to talk about the experience of other plants than my own.

Last Sunday we used 11 motors and 4 trailers and handled 2,000 passengers more than the Sunday before, and it took 10 pounds less steam last Sunday than the Sunday before. The first Sunday the engines were being pulled very hard, and the engineer in the station had considerable trouble about his steam and he reported it to the superintendent, and as each man left the barn last Sunday he notified him to handle his car carefully and take current carefully, and if a circuit breaker should fall, to have the cars start alternately, and the result is what I have stated. I have not as yet taken the coal test.

Mr. Copeland—What do you mean by ten pounds less steam?

Mr. Bean—If 100 pounds carried the load Sunday before last, then we carried 2,000 more last Sunday with 90 pounds of steam.

In regard to coal I would say that we can produce as much steam with ordinary slack coal at $1.00 or $1.50 (under our conditions) as we can with lump, within 5 per cent., and so we use slack in our plant. We run for two towns, 24 hours a day. We run cars commencing at 6 a.m. in the winter, and 5:30 in the summer, running until 12:30 a.m. We have an engine running all the time, generators running 19 hours and a dynamo running 24 hours a day.

Mr. Louis A. Ferguson of Chicago—We found on trial in our larger plant in Chicago that the wattmeter system suggested was unnecessary, as our load is very regular and practically a full load at all times. But I can very readily see that in railway plants where the load fluctuates from to 400 or 500 amperes in a very short time, watt-meters would be exceedingly useful, and in fact necessary to get an accurate determination of the load.

There was one question asked by a gentleman here a few moments ago regarding the difference in the readings of the station recording wattmeters and the wattmeters on the customers' premises. In the large Edison stations it is found that the difference is practically 18 to 20 per cent. That is, there is a loss of 18 or 20 per cent. of energy which is unaccounted for. Of course it is partially due to the loss on the line and the balance is unaccounted for. In alternating stations where the ampere meters and voltmeters are used on the switchboard, the difference may be as high as 50 per cent., but with wattmeters on the switchboard and at the customers' premises it is not so large of course.

Mr. Copeland—You would not consider it very bad then to lose from 25 to 30 per cent. for a small station, covering a pretty large territory, using the 3-wire system over a territory 1¼ to 1½ miles square.

Mr. Ferguson—I should think in a direct current station 25 per cent. would be as large as you should have. Otherwise you might suspect some one of stealing your current from you.

Mr. Copeland—We have gone as low as 16 and as high as 30 per cent.

Mr. T. F. Grover of Fond du Lac—Have any of the gentlemen made any experiments far enough so that the central stations generally could get together and know how many watts per pound of coal they can produce in the dif-

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ferent stations? Most of the gentlemen with whom I have spoken and who use wattmeters do not appear to keep those records, although I know of some of them that do; but I think that if there was a record kept by all stations of the watts per pound of coal, a great many of us could find out whether we were throwing a lot of coal away or doing good with it, and I would like to ask Brother Bean if he has figured out the watts per pound of coal.

Mr. Bean—I have the records at home.

We have a street lighting contract with St. Joseph, and one with Benton Harbor, and meter records for both towns. We have a commercial arc circuit for both towns, and a meter on each circuit. I have those records in my station and I hope by the first of July to publish in a general way just what you want.

Mr. Ferguson—In Chicago for the past four or five years we have been keeping the cost per kilowatt hour of the fuel in all of our stations, keeping it daily, so that we know every morning just exactly what it costs per kilowatt hour at any given station the day before. In that way we are enabled to follow very closely the operation of the station. In most of our stations we have recording wattmeters on the switchboards but not in larger stations, for the reason that the ampere-meters and the voltmeters read so closely to the recording wattmeters that it is unnecessary to use the wattmeters on the switchboards.

We made an interesting contract two years ago, for a suppy of coal for one year, and in that contract we were guaranteed that the cost per kilowatt hour of our fuel should not exceed a certain amount. Now if we could buy our coal on that basis all the time we would be in splendid position. Unfortunately for us, one year was sufficient for the coal operator and we have never been able to make a contract like that since. (Laughter).

Mr. Grover—We do keep a record every day, as Mr. Ferguson says, of not only the watts per pound of coal, but the cost of coal per kilowatt. The size of Mr. Ferguson's station of course would cut it out of our list, but I would like to be able to find the smaller stations that would compare with ours, and I think if we could get together on this point it would be an advantage all round, because we could all see where we were losing; and I should say that if one of our small central stations running on similar conditions with another could get 200 watts out of a pound of coal, and the other station only half that, that that information would be very interesting.

Mr. Copeland—There is something that Mr. Grover wants to know, and I presume that he is prepared to answer the questions he is asking of others, viz., what does it cost per kilowatt to generate that current, what kind of engines and what price of coal.

Mr. Grover—Our coal varies a great deal in price, and in fact we have to job it wherever we can, but I think on an average we will run about 8 mills a pound with condensing engines. We have both types of boilers. We have been using the ordinary tubular boilers, but are now installing different boilers. One of our engines is compound, high-speed, and we have a cross compound, low-speed tandem. We use Youghiogheny screenings for which we have paid all the way from $1.85 to $3.65.

Mr. Copeland—I am using Youghiogheny lump coal and we have four engines. One of them is a compound condensing. That is only run from the lighting up time in the evening till about 10 o'clock. The balance are just straight engines to run condensing. Our coal is $4.40, and it costs us just about a cent now. If the engines were all compound we would get down to about 8 mills.

Mr. Frank McMaster of Chicago—In arriving at these figures do you take into account the expense of having one of your compound condensing engines lying idle, as compared with a high-speed engine.

Mr. Copeland—We estimate the cost under all conditions for a length of time—not for an hour, but, say for a month.

Mr. Ferguson—If Mr. Grover will refer to the proceedings of the National Electric Light Association of two years ago, he will find there a paper showing the statistics which he wishes to obtain.

Mr. Grover—I saw that article, but I believe it referred mostly to the Eastern stations, and the conditions are somewhat different in the Northwest. The article that I saw did not give the names of the stations, and, consequently, you could not determine whether they were Eastern stations, or whether they were stations in the Northwest, and as they burn hard coal in the East principally, and in the western part of Pennsylvania and Ohio soft coal, at a very low price, I did not think it was quite the comparison I would like to have.

ALTERNATING CURRENT GENERATORS.*

BY H. G. REIST.

Since the general introduction of alternating current followed the extensive use of direct current machinery, it was very natural that the same type and method of construction used in the latter should be adopted, and revolving armature generators resulted. With the small sizes which were at first built and the moderate potentials of that time, these machines were satisfactory and there was little reason for any change: but with the development of the art, various improvements and modifications suggested themselves, one of the most important being the introduction of machines with revolving fields. These machines offer many advantages of construction and operation, and are rapidly displacing the machines of the older form.

The regulation of the potential of alternating current machines has always been an interesting problem and one for which a solution has been eagerly sought for some years. There have been various steps in solving this problem that may be briefly traced with interest. The first machines were separately excited, but it was soon found that some form of automatic regulation was desirable, and methods of compounding were devised. This was done either by rectifying the line current or a current derived from a series transformer in the main line. For a load with a uniform power factor, this method of regulation is quite satisfactory, but with a mixed load of lighting and induction motors it leaves much to be desired, since if the machine is adjusted to regulate for a load of one kind, it will either over-compound or under-compound for the other condition. If the machine is adjusted to give the proper potential at the end of a line with a lighting load, it will be too low if motors are added. If adjusted for a motor load, it will be too high if lights are operated alone. It was with a view of rectifying difficulties of this sort that the compensated machine was devised. This was so named because it compensates or equalizes for loads of variable power factor, and will give the potential that the machine is adjusted for—whether the load is non-inductive or whether it is an induction motor load or a mixed load, i.e., you may have a load consisting entirely of lamps and the machine will compound to 2,300 volts at full load, or you may have a motor load and the same potential. The same is true if the load consists of half lights and half motors—always with a given load the potential at the generator will keep constant. This is a feature of very great value as will be appreciated by all who have operated alternating current apparatus.

As stated above, the earlier alternating current generators were usually built of the revolving armature type, the first machines having the winding placed on the surface of the smooth core, but later it was placed in slots of the then so-called iron-clad armature. This allowed of the use of entirely enclosed armature coils, thus making possible an insulated covering of a quality unknown in earlier dynamo construction, but the supporting of the coils on the revolving armature either by bands or by clamps or shield-rings of various sorts was always a troublesome matter. The collector-rings for the higher potentials have also been a detail to which there was considerable objection, both on account of the difficulty of constructing rings satisfactorily insulated for higher potentials and also on account of danger to the attendant. It is unusual to find machines having a higher potential than about 3,300 volts of the revolving armature type, largely for this reason. For very low potentials, on account of the large current to be taken from the collector-rings, the revolving armature machine is also not suited.

ARMATURE.

With the introduction of revolving field generators, many difficulties that are inherent to the revolving armature machines have been overcome and a construction much more satisfactory in every way has become possible. We are now enabled to produce machines which have stationary armature coils which require comparatively little fastening in the armature and which may be wound for all potentials from the lowest to 12,000 volts or more, with entire satisfaction. In the case of high potential machines, the terminals are usually entirely enclosed so that it is impossible for the attendant to be injured by them either from carelessness or accident. On low potential machines the feature of having stationary armature coils is just as desirable since the current is led through stationary parts only and does not have to pass through brushes. The coils of the armature are wound directly into their final shape and then filled with insulating compound. The insulation consists of a number of layers of tape, the number varying with the potential of the machine, each layer being carefully coated with varnish, thus making a coil insulation practically airtight and water-proof. On high potential machines the insulation is so important a matter that it is usual to put only one coil in each slot, and also to reduce the number of slots per pole so that the total percentage of space occupied by insulation is not too great. This produces a winding in which there is more than one shape of coil. On smaller machines the so-called "barrel" winding is generally used, because such machines are built of lower potentials — generally 2,300 volts. In this case only one kind of coil is used, and

*Abstract of paper read at the Twenty-third Convention of the National Electric Light Association, Chicago, Ill., May 22-24, 1900.

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when the coils are placed in the machine they produce a very symmetrical structure. The armature coils are held in place by wooden wedges which are easily removed and form a thorough protection for the coils in case foreign matter should accidentally find its way into the air gap. The advantages of stationary coils are very great as they are not subject to injury from mechanical strains produced by centrifugal force. There are no bands, so their removal is a very simple matter, and lastly, the ends are free to the air on all sides instead of being bound down to a supporting head. On larger machines it is usual to arrange the armature so that it may be slid on rails in a direction parallel to the shaft until the armature and field are free from each other and either part is rendered accessible for repairs or cleaning. The extra space required for this purpose is usually very small since a part of it is always necessary for the collector-rings supplying current to the revolving field. The armature core is usually built up of the best quality of thin sheet-iron carefully annealed and the laminæ insulated from each other by paper or japan.

REVOLVING FIELDS.

The revolving field structure is a detail which has received some of the best thought of electrical designing engineers for the past few years. The pole pieces are made of punchings of heavy sheet iron about $\frac{1}{16}$" in thickness, with a composition end plate, the whole fastened together by means of rivets, or in some cases with bolts. These pole pieces are fastened to the field ring by two methods—in belted machines by means of a projecting dovetail on the pole piece which enters a groove in the field ring, and is secured by keys with a very slight taper, so that by light blows of the hammer on this key a very secure fastening is obtained. In the case of slow-speed machines where the centrifugal force is less and the diameters of the field rings greater, more lightness and sufficient strength is obtained by fastening the poles by means of bolts. Except in the very small machines, the field copper consists of a flat ribbon wound on edge, so that the coil is only one layer in depth, the outside surface of which is bare. Every turn is thus exposed to the surrounding air, and it is impossible to have a coil warm on the inside. The surface of the coils being flat gives large bearing of the turns of the coil on the insulation, thus not allowing any opportunity for the windings to shift on each other and short-circuit. The turns are insulated from each other by sheets of paper. These coils form a striking contrast and improvement when compared with field coils of machines built heretofore.

FLY-WHEEL ALTERNATORS.

By somewhat enlarging the diameter of the armature, the yoke of the revolving fields can readily be made large enough to serve as a fly-wheel for the generator. This, while making the cost of the generator somewhat greater than if a separate fly-wheel is used, still offers many advantages so that it will probably soon be the usual construction of the engine-driven alternators. Some of the advantages of this form of construction are that the shocks due to sudden changes in load are directly transmitted from the pole pieces to the fly-wheel mass, and not as with the older construction, through the arms of the dynamo spider, through the shaft, then out through the fly-wheel arms, the total weight of the parts on the shaft may be reduced, since only one hub and spider is required; the length of the shafts may be greatly reduced, thus also reducing its diameter, and the size of foundation and space occupied by the machine. This construction moreover makes a more compact and symmetrical piece of machinery than if a separate fly-wheel is used.

COMPENSATED GENERATORS.

The above general remarks on revolving field generators apply equally to the line of compensated machines which has been developed by the General Electric Company, and to which I would like to call your attention. These machines so far have been built belted only, and the exciter mounted on the shaft of the revolving field, and in their design all the best features of years of experience have been incorporated.

EXCITER.

The exciter of one of these machines has the same number of poles as the generator. They are wound for 60 volts on smaller machines and 125 volts on larger ones. The poles are stationary, and the armature revolves as is usual in direct current machines. The construction of the exciter is the same as in direct current multipolar machines only on account of the small energy necessary for exciting, the parts such as the pole pieces and armature coils are very small. There are three taps in the exciter armature which are connected to collector-rings on the shaft—on the smaller machines on the outside of the bearing and on the larger ones, between the bearing and the armature. The exciter is placed within the shield of the alternator which allows a construction to be used that does not destroy the symmetry of the machine and affords protection for the exciter. For direct-connected machines the exciter is mounted on the outboard bearing of the engine and is driven by means of enclosed gears. In this way an exciter may be used with a smaller number of poles than is used on the generator.

BRUSHES.

The machine is entirely equipped with carbon brushes and in all cases there are at least two brushes in multiple so that any brush on the machine may be examined, cleaned and replaced while the machine is in operation.

BEARINGS.

The bearings used in these machines are the usual spherical self-oiling, self-aligning bearings made of a heavy cast-iron sleeve lined with anti-friction metal. The bearing next to the pulley is made especially large, both to ensure stiffness of the shaft and to avoid wear and heating. The small bearing next to the exciter has only very light pressures on account of the long distance between bearings. The arrangement which has been adopted on these machines allows the bearings to be placed far apart—yet keeping the machine as a whole very compact, which is a very desirable feature on machines with two bearings. The oil rings of all the larger bearings are made split, so hat they can be readily removed without taking the shaft out of the bearings if it is desired to do so.

METHOD OF COMPOUNDING.

It is well known that when the load on an electric generator, direct or alternating, is increased, the potential will drop unless the field excitation is also increased. This is due to the resistance of the armature, the inductance of the armature, and the reaction of the armature on the field poles, the latter reducing the amount of effective magnetic flux. The potential at a distant point, where the current is used for lights and motors, falls even more on account of the resistance and inductance of the line. To compensate for this D.C. dynamos have been compounded by passing the main current through series coils on the poles and so adjusted that the potential at the machine increases with increasing load. On alternating and multiphase machines the same result has been obtained by rectifying the main or an induced current, and using it for the same purpose; and, except for a slight increase in complication, the method is just as effective as on D. C. machines, so long as the alternating current is in phase with the potential, which unfortunately is rarely the case in ordinary operation, since partly loaded transformers and induction motors produce a lagging current which requires a greater field excitation to produce the normal potential. Thus in all types of alternators heretofore designed the compounding required for non-inductive load has been entirely insufficient for inductive conditions. With the loads that ordinarily have to be provided for on alternating current circuits, there are wide variations in power factor, especially in case where considerable proportion of the load is in motors. Therefore, the introduction of automatic means of field adjustment for all kinds and degrees of load is of the greatest practical value. This is what is being obtained by this new method of excitation, which is based on a radically different principle from anything that has heretofore been employed and gives an automatic compounding far superior in results from that which can be obtained by any other known method, and at the same time there is nothing but the simplest and most reliable mechanism used, in fact without any mechanical change or adjustment. The devices by which this result is accomplished are mechanically simple. The shaft of the alternator which carries the revolving field also carries the armature of the exciter. The exciter has the same number of poles as the alternator, so that the two operate in a synchronous relation. Besides being connected to the commutator, which delivers current to the field of the alternator and to the field of the exciter, the winding of the exciter armature is connected to three collector-rings. Over these collector-rings it receives current from one or several series transformers inserted into the lines leading from the alternator. This alternating current passing through the exciter armature, reacts magnetically upon the exciter field in proportion to the strength and to the phase relation of the alternating current. In consequence thereof the magnetic field, and hence the potential of the exciter, is due to the combined effect of the shunt field and the magnetic reaction of the alternating current. The connections between the armature of the two machines are so made that the poles induced in the exciter armature are somewhat ahead of the exciter field magnetization, but still so that they will assist the field magnets. The result is that with increasing current the current passing through the exciter armature strengthens the exciter field and thereby the field of the generator. If the current lags, as under an inductive load, the poles produced by the alternating current in the armature come more nearly in line with the exciter field poles, thus strengthening the field more with a given line current. This is so adjusted as to give the necessary rise of exciter potential as the non-inductive load increases and without other adjustment to give a greater rise of exciter voltage with additional inductive load.

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USES OF MACHINES.

These generators may be used very satisfactorily as single-phase machines for a lighting load on two lines and motors placed between the lighting terminals and the third wire. In this case the machines are adjusted so as to give a correct potential on the lighting circuit, whether the load is due to a lighting load or to a motor load. For small stations this is a very desirable method of installing a plant as only a single lighting circuit is necessary, and the attention given to the machine can be reduced to a minimum. A second method of installation which has found considerable favor of late is to install a 240-volt generator, which is Y connected, and which has a fourth wire brought out from the common connection. The lights on a machine of this sort are placed between the neutral wire and the three terminals of the machine, arranging the lamps so as to approximately balance the load. This, however, is not very essential as the unbalancing effect with this arrangement is almost negligible. For factory distribution work this is a very convenient arrangement, as no transformers are needed, and the power and lights are distributed from the same circuits with a minimum amount of copper, and with almost perfect regulation. The usual method of distributing a general system of lights from three-phase generators is to transmit the current over the line by means of three wires, and to transform with the transformer primaries connected delta and the secondaries Y, connecting the Y connections with a neutral wire, and the whole to a system of secondary mains, and approximately balancing the lights in each important installation. In this way a very efficient distribution of the power is obtained with a minimum amount of copper and the generators are used to the best advantage as all branches are fully loaded and motors can be installed at any point. In large installations it is usual to have potential regulators in each branch to take care of slight unbalancing that may occur. These regulators may be made to operate automatically, keeping the constant potential at some distant distributing center, if it is so desired, or at the station. Two general types of potential regulators are used for this purpose. The magnetic regulator, which is used in smaller sizes up to about 6 kw., and the compensator regulator, which is used on large sizes. In connection with the compensator regulator, an ingenious switch has been devised which snaps from point to point, carrying current momentarily through an arc which, however, is interrupted immediately when the second contact is made.

Another use to which this machine can be put is in the operation of series enclosed arc lamps, which are so largely coming into use at the present time in connection with the constant current transformers. Here the load is quite inductive, and it is hard to operate with incandescent lights without hand regulation, but the machine takes care of such loads perfectly.

In conclusion I will say that I have seen a 75 kw. belted machine start a 50 hp. induction motor belted to another machine, so that it had a considerable load with a fluctuation so brief on the lights as not to be noticed unless it was especially looked for, the voltmeter needle swinging perhaps five volts for a very small period of time—say $\frac{1}{10}$ of a second, coming back again to its normal voltage, or in fact, to a higher potential than before, on account of the compounding, in a surprisingly short time. On observing the tachometer on the generator under these conditions, it was found that it also fluctuated, possibly to the stretching of the belt as the load was put on; thus my conclusions are that there would be actually no fluctuation under these conditions with constant speed.

POWER SUPPLY BY SINGLE-PHASE MOTORS.*

BY T. P. WILMSHURST,
Borough Electrical Engineer, Derby, England.

NOTE.—In the following paper the abbreviations D.C., A.C. and S.P. refer to direct current, alternating current and single-phase respectively.

The principal objections which are usually urged to the distribution of electricity by alternating currents are:

(1) That alternating current is less economical than direct current working.

(2) That alternating arc lamps are inferior to direct current lamps.

(3) That single phase motor working is impracticable.

While the writer is prepared to admit that in some instances objections (1) and (2) are valid, and (3) also in a modified degree, he holds the conviction that they originate rather from unsuitable arrangements or want of appreciation of the varied requirements of electrical supply on the part of the designers, than from any inherent insuitability of alternating currents.

He is led to this conclusion from a study of the cost's analysis of various towns, from which it appears that the following results have been achieved in A.C. stations:—full costs of .25d., .3d., and .32d., and works costs of .78d., 1.02d. and 1.16d., all on outputs of less than a million units per annum. As regards objection (2) the writer would only remark that those members of the Association who visited Cheltenham during the last Convention would hardly deny that the A.C. arc lighting there left little to be desired.

Coming to objection (3) the object of the paper is to show what is the present position of the S.P. motor in the struggle for existence.

In nearly every town, certainly in all manufacturing towns, there will in the future be an enormous demand for motors when the cost of supply is sufficiently low and the public appreciate the advantages of electric driving. Since the S.P. system has been adopted in nearly 100 towns in this country, the question arises, how is this demand to be met?

(1) Shall we change over our whole system to D.C. as is proposed in one or two cases?

(2) Shall we lay down D.C. plant and mains for the motor supply, leaving the A.C. plant to supply current for lighting?

(3) Shall we supply S.P. motors from our ordinary A.C. plant and mains?

(4) Shall we lay a special A.C. motor net-work supplied from the A.C. plant?

(5) Shall we lay down multiphase plant for power supply?

The writer has come to the conclusion that while cases do exist in which by reason of abnormal frequency, excessive armature drop in the generators, or other causes, the good working of A.C. motors is rendered difficult, in the majority of cases, under reasonably favorable conditions, the inferiority of the S.P. motor to the D.C. or 3 phase motor is not sufficiently marked to justify the laying down of special plant.

It is obvious that method (3) has the great merit of simplicity and low cost.

It is a matter of common knowledge that at the present time, while the proportion of motor to lighting load on D. C. circuits is small, it is still less on A.C. circuits, and it is a matter of interest to study the causes of this.

The two principal reasons appear to be the difficulty of successfully competing in cost with gas and steam engines and the fear that the use of motors will injuriously affect the steadiness of the light. It is a self-evident truth that the more the day load can be increased the lower can the charges be made. An examination of the power charges in various towns reveals the curious fact that these charges vary from 8d. per unit down to 1d., and inasmuch as the cost of production can hardly vary within such wide limits, it would appear that the size of these charges is a measure of the appreciation by the engineer of the value of a motor load. In the case of a gas engine a brake horse power can be obtained for about 1d. per hour; in the case of electric motors, therefore, it is necessary to bring the cost down to 1d. to 1¼ d. per unit before we can hope to enter into successful competition.

The second point is of vital importance and merits careful consideration.

The principal causes which are likely to disturb the supply voltage are:

(a) Bad regulation in engines, alternators and transformers.

(b) The use of small generating sets and transformers.

(c) Defective working of the motors themselves.

(d) The adoption of a high frequency.

The first (a) is a prolific source of trouble. An armature drop of 20 per cent. to 30 per cent. even on non-inductive loads is by no means uncommonly found in this country. Why these abnormal drops of pressure have been tolerated it is difficult to say. It is obvious that the starting of a large motor on mains supplied by such a machine must cause an instantaneous drop of pressure which no amount of switchboard manipulation can prevent. When one considers that in a D.C. station an armature drop of 6 per cent. is rarely exceeded, is it any wonder that A.C. motor working on such circuits has been discouraged?

A similar abnormal drop may also be found in transformers which have been designed for a lighting load only. It is quite possible that a transformer with heavy magnetic leakage may have three or four times the terminal drop on a motor load which it would have on a lamp load. It is therefore obvious that all transformers before being sent out should be tested on an inductive load in addition to the non-inductive load test. The writer has adopted the practice in specifying for transformers that when tested on a non-inductive load the drop shall not exceed 2 per cent. and not more than 3 per cent. when tested on a load with a power factor of .75.

(b) The question of the size of the day load sets is one which will right itself as the motor load increases, since the possibility of any single motor disturbing the supply will diminish as the number of motors increase, and this may therefore be classed as a temporary difficulty only.

(c) The chief defects are heavy starting current and low power factors. The starting current in a S.P. motor need not necessarily be abnormal, though undoubtedly this often is the case, and it is surprising that A.C. engi-

*Paper read before the Municipal Electrical Association.

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neers do not more rigorously insist on the starting current of motors being kept down. It is purely a matter of what starting torque is required, and it can be brought as low as two-thirds of full load current or less by suitable arrangements.

(d) A high frequency was adopted in the early days when it was common practice to install small transformers in houses, with a view of keeping down the iron losses, the designers loosing sight of the objection to a high frequency in view of motor working. It is well known that with a low frequency, a motor has the advantage of higher efficiency, higher power factor and smaller starting current.

The writer trusts that he has shown that the prejudice against the single-phase motor has its root not in any inherent defect in the motor but in the insuitable nature of the appliances used.

It will be seen that direct-current engineers would have equal cause to complain of their motors if they tolerated the defects in their systems which alternating current engineers accept as inevitable.

Imagine a D. C. engineer being first hampered with a 25 per cent. drop in his armature, then a drop in his feeders and distributers corresponding to the drop in the feeders, distributers and transformers (the latter wound for non-inductive loads only), allowing motors to be started from rest by means of a resistance so imperfect as to pass double or treble the full load current, and we should not be surprised at his complaining of the disturbance caused by his motors.

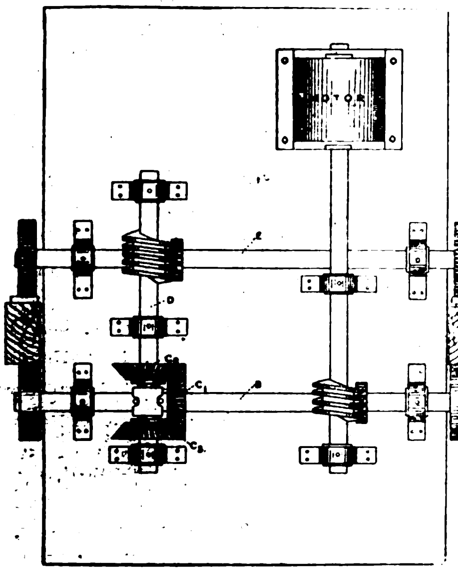

FIG. 1.

Consider now the A.C. engineer with the added losses caused by a power-factor less than ninety and we see his difficulties in the face of insuitable plant.

The writer believes that it would be well worth while to go to the expense of re-winding alternators with these abnormal drops, to use only transformers rated on a power basis and in extreme cases to bring down the frequency to a reasonable value.

Exception has been taken to the S.P. motor owing to its alleged inability to start against a load. This allegation is quite unfounded, as this condition can be complied with, but at the expense, of course, of starting current.

It appears to the writer that this point has been labored too much, as there are few cases in which a fast and loose pulley cannot be arranged. Moreover this defect has not prevented the enormous use of gas engines, which, so far from being able to start against a load, have actually to be pulled round by hand before they will start at all.

Even in the case of lifts there is a wide sphere of utility for S.P. motors. The writer has a lift worked by an S.P. motor on the Derby mains which is perfectly satisfactory. Although the motor starts light, the lift is working at full speed within 7 seconds of the motor being switched on. A short description may be of interest.

Fig. 1 is a plan of the cage; the motor and gearing are fixed on the top of the cage and move with it. The motor, a 4 B.H.P. Langdon-Davies, is switched on inside the cage and quickly runs up to speed, simply driving its own spindle and spindle B, and also the bevel wheels C_1, C_2, C_3; the two latter are at present loose on their spindle. The starting lever inside the cage when pulled over brings a friction cone to bear on the inner surface of the shoulder on bevel wheels C_1 and C_2. This throws shafts D and E into gear and causes the lift to rise or fall at will.

The time necessary to start the lift, i. e., 7 seconds, is sufficiently short to justify the contention that the S. P. motor can be used for lift purposes in a great variety of cases.

A few notes as to what is actually being done on supply systems with S. P. motors may not be out of place,

For purposes of comparison, it is a matter of interest to note what is being done in a city where the D. C. motor business is vigorously pushed.

In Bradford the low charges and easy terms of hire have resulted in a considerable motor load being obtained. Up to the end of June 1899, there were 307 motors connected to the mains, and the proportion of units sold for power to total units sold was about 17 per cent.

It is doubtful if this result has been equalled in any other town in the country.

It will perhaps be somewhat of a surprise to some members of the Association to find that on the Continent the above results have been far eclipsed by the use of S. P. motors. In the city of Frankfort, on March 31, 1899, there were single-phase motors of an aggregate of no less than 4,532 B.H.P. connected to the mains, while the proportion of power units sold to total units sold was no less than 58 per cent., the figures being, for power 1,851,268 units, and for light 1,342,399 units, total 3,193,667 units sold. The largest motors are of 750 B.H.P. of which there are three. They are of the synchronous type and are coupled to D. C. generators, and are used for driving the trams. With the exception of these all the motors are of the induction type, the largest of which are of 90 B.H.P. The larger motors are run from separate transformers fed from the nearest feeders, while the smaller sizes are taken direct from the low tension network, while the steadiness of the light leaves nothing to be desired.

The generating sets are as follows:

Two of 1,500 I.H.P. and four of 750 I.H.P. The frequency is 45 periods, and the armature drop, 6 per cent.

The charges for power are equivalent to 2d. per unit with discounts up to 25 per cent.

The Corporation of Derby have within the last few months commenced letting out S. P. motors on hire with gratifying results. At the present time motors equivalent to about 200 B.H.P. have been connected, of various sizes up to 30 B.H.P., and the units sold for power during the year have amounted to about 12 per cent. of the total units sold. The charges vary from 3d. to 1d. per unit according to the length of time the motor is used.

A few words may now be said on the chief characteristics of the modern S.P. motor.

The only practical motors on the market are of the synchronous and the induction type. The synchronous motor requires its field to be excited by a direct current. It is not usually self-starting, and this defect precludes its adoption for any but large sizes. It has an extremely high efficiency and power factor, and it runs at a synchronous speed.

The induction motor, which is almost exclusively used, has been greatly improved in recent years. A few years ago the maximum efficiency was not expected to be more than 60 per cent. to 65 per cent. with a power factor of about the same value, while the starting current even when the motor started light was often twice or three times the full current. Thanks, however, to the good work of Tesla, Brown, Langdon-Davies, and others, very marked improvements have been affected within the last two or three years.

The following table gives a good idea of the efficiencies of modern single-phase motors, as compared with direct current and three-phase motors. All the tests are made from motors actually at work, the S.P. motors being on the Derby mains. The motors were all made by leading firms, and though the figures do not necessarily represent the highest attainable results, they are a fair sample of good modern practice:

Type of Motor.	Brakes. HP.	EFFICIENCY. Full load.	Half load.	Quarter load.	Eighth load.
		%	%	%	%
Direct current.....	4	78	68	58	..
" "	8	84	77	59	85
Single phase.......	2	78	70	62	..
" "	6	80	76	62	46
Three phase.......	10	83.5	82	72	55
Single phase.......	12	75	78	68	54
" "	25	80	83	80	68
Three phase.......	25	87	86	82	72
Direct current.....	25	91	83	75	54
" "	25	86	78	66	..

In conclusion the writer would urge that while the S.P. motor still leaves much to be desired in the matter of power factor, starting current, starting torque, and facility of running at variable speeds, yet the absence of commutators with their attendant troubles giving such simplicity in working, together with the high average efficiency, renders it eminently suitable for general distribution work.

As is shown in the table the polyphase motor outstrips both its competitors in point of efficiency. The writer would suggest that, should a transformer or other appliance be placed on the market which without moving parts would convert a single-phase into a polyphase current, in the same manner that a two-phase can be converted into a three-phase current, in this direction may lie the solution of the motor problem.

With the increase in size of our stations, the engineers of direct current works are more and more realizing the advantages of alternating currents for generation and transmission.

The improvements in modern A.C. motors have gone a long way to lessen the force of the objection to alternating currents for distribution purposes as well, and the writer's experience justifies him in the opinion that the A.C. motor (either single or polyphase) is quite capable of satisfying all ordinary demands for power from the mains of public supply undertakings.

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LEGAL NOTES.

An opinion was handed down last week by Judge Shipman, in the Circuit Court of New York, in the case of the Thomson-Houston Electric Company versus the Lorain Steel Company. This bill in equity alleges infringement by the defendant of claims 1, 2, 3 and 4 of letters patent No. 428,169, dated May 20, 1890, issued to Walter H. Knight for an improved electric motor regulator. The patent has been owned by the complainant since November 7, 1891. The invention was adapted to electric railway motors working on a circuit of "constant potential," and was designed to prevent the sudden overloading of the motor. Judge Shipman, in his opinion, held as follows: "Let there be a decree, with costs, for an injunction against the infringement of claims 1, 2, 3 and 4 of the patent and for an accounting."

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Ontario Power Company will begin development work at Niagara Falls this summer, developing first 30,000 to 50,000 horse power. The company has applications for 30,000 horse power.

The Dominion Government has received an application from Hon. Fred. Peters and Mr. E. O. Fader, of Victoria, B. C., for certain shore rights in the harbor of Vancouver B. C. They propose to utilize the rise and fall of the tides there to generate electric power, which will serve Vancouver, New Westminster, etc., and at the same time provide electric power upon a cheap scale.

Mr. J. P. Graves has made an offer to purchase from the city of Grand Forks, B. C., the water works and electric light plants for the sum of $70,000 and to expend a further sum of $30,000 in improving the systems. He also seeks to acquire an exclusive street railway franchise. In return for a bonus of $30,000, Mr. Graves offers to provide waterworks, electric light and trolley systems for the city of Columbia.

At a meeting of the shareholders of the Montreal Electric Street Railway, held on the 10th inst., the agreement between the Street Railway Company and the Chambly Power Company was ratified. The agreement requires the delivery by the latter company of 5,000 horse power continuously for a period of 23 years, with the privilege of renewal for a further term of five years, at $25 per horse power per annum.

The ratepayers of Sault Ste. Marie, Ont., have adopted a by-law granting exemption from taxation and certain other concessions to the Lake Superior Power Company, in return for which the company agrees to construct additional works, at a cost of $2,000,000, such works to include an additional water power canal, a railroad, railway station, wharves and docks, and the building of a street railway.

The Canadian Electrical Association

The city council of Kingston, Ont., will invite the Electrical Association of Canada to hold its annual convention there in August next. The convention was to have been held at Ottawa, but the fire in that city prevented. The Kingston city council will vote a sum of money for entertainment of the Association. There will likely be 400 members in attendance.

PERSONAL MENTION.

Mr. L. S. Owsley was elected president of the Northwestern Electrical Railroad Company of Chicago on the 13th inst., succeeding D. H. Louderback, who resigned.

Mr. Albert N. Libbey, representing the engine department of the Edward P. Allis Company of Milwaukee, Wis., recently returned from Sidney, Australia, where he has been for two years engaged in the setting up of an electric plant of 6,000 horse power for the Government.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended July 14:

Antwerp, 2 cases, $324; 28 packages, $2,252; Alexandria, 14 cases, $1,200; Bari, 3 cases, $1,060; Bordeaux, 14 packages, $808; Brazil, 4 packages trolley appliances, $211; 5 cases $158; British East Indies 34 packages, $2,643; Bristol 66 electric cables, $10,007; Brussels, 7 boxes, $91; British Possessions in Africa, 15 cases, $894; Central America, 22 packages, $521; Cuba, 168 cases, $25,802; Genoa, 19 trolley poles, $1,100; Glasgow, 2 cases, $436; 10 packages, $402; 1 case motor material, $40; 15 trolley poles, $750; Hamburg, 96 packages, $6,498; Havre, 50 packages, $4,801; 18 packages automobiles, $2,550; Hull, 1 package, $38; Japan, 67 packages, $3,601; 20 reels cable, $6,398; Leith, 9 cases, $250; Liverpool, 1,202 cases, $7,394; London, 97 cases, $9,413; 72 packages, $5,855; 51 cases automobiles, $18,000; Marseilles, 51 packages, $2,000; Mexico; 17 packages, $485; 1 reel cable, $200; Milan, 2 packages, $296; Naples, 175 packages, $35,115; New Foundland, 8 packages, $143; Nova Scotia, 57 packages, $6,318; Odessa, 7 packages, $980; Peru, 3 cases, $202; Philippines, 33 cases, $1,895; Porto Rico, 79 packages, $2,686; Siam, 21 cases, $1,235; Southampton, 26 cases, $728; Stockholm, 1 case, $225; St. Petersburg, 17 cases, $661; U. S. Colombia, 6 packages, $152.

Awarded Two Good Contracts.

J. Holt Gates & Co., of the Monadnock Building, Chicago, have been awarded the contract for the new Urbana, Ill., electric light plant, and will install one 60 k.w., 250 revolutions, and one 120 k.w., 250 revolutions, direct connected Warren alternators to Ideal engines. This plant will be particularly interesting aside from its direct connected features, from the fact that each dynamo will have an output at 7,200 alternations of 220 volts on one side of the machine and 2,200 volts on the other, thus running a three-wire system without transformers for the nearby lights and a high pressure system for the lights at a long distance from the plant. A beautiful switchboard will be installed and Warren Electric Manufacturing Company's transformers used thoughout.

The city of West Hammond, Ill., have awarded the complete new electric light plant, comprising two 30 k.w. Warren alternators and one 40 light arc machine, to J. Holt Gates & Co. A new building will be erected, boilers added and the old plant will be completely overhauled.

INCORPORATIONS.

The Trinity Place Electric Company, New York City. Directors: James W. McCarthy, John F. Jacobs and A. J. Herschmann, all of New York City.

The General Construction Company, Ft. Wayne, Ind.—to construct electric lighting plants and street railways. Capital stock, $40,000. Incorporators: T. W. Perry, P. F. Meyers and G. M. Geiger, all of Ft. Wayne.

The Peekskill Lighting Company, Peekskill, N. Y.—to manufacture electricity and gas for light, heat and power purposes. Capital stock, $50,000. Directors: Benjamin B. Nostrand, Jr., Peekskill; H. Hobart Porter, Jr., and Francis Blossom, New York City.

The Kincaid Electrical Company, Colorado Springs, Col. Capital stock, $45,000. Incorporators: E. E. Bat. F. G. Armstrong and J. C. Kincaid.

The Incandescent Burner Company, New York City. Capital stock, $6,000. Directors: J. Wallis Cook, David Touzeau and John T. Booth, all of New York City.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED JULY 10, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

653,316. Trolley. William H. Russell, Watertown, Mass. Filed Nov. 23, 1899.

653,402. Safety-Trolley. John W. Richmond, Fishkill-on-the-Hudson, N. Y. Filed March 28, 1900.

653,549. Electric Trolley. Thomas Derrick, Lansingburg, N. Y., assignor of three-fourths to Adam Derrick, George Vandercook and George A. Dicker, same place Filed Jan. 27, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

653,253-653,254. Incandescent-Lamp Burner. Otto Lehman, New York City, assignor, by mesne assignments, to the Standard Incandescent Burner Company, Portland, Me. Filed Feb. 11, 1899, Nov. 15, 1899.

653,554. Circuit-Controller for Incandescent Lamps and Magnetic Guide Therefor. Marshall W. Hanks, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed April 22, 1899. Renewed May 25, 1900.

653,572. Electric-Arc Lamp. John A. Fleming, London, Eng. Filed Dec. 23, 1899.

653,577. Thermo-Electric-Light Cup. Clarence R. La Bier, Terre Haute, Ind., assignor of one-half to Charles H. Hilton, same place. Filed Feb. 5, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

653,353. Igniter for Explosive-Engines. Fred A. Law, Hartford, Conn., assignor, by mesne assignments, to the Columbia & Electric Vehicle Company, Jersey City, N. J. Filed July 26, 1898.

653,470. Self-Starter for Electric Motors. Henry H. Cutler, Chicago, Ill. Filed June 8, 1899.

653,471. Controller for Dynamo-Electric Machines. Henry H. Cutler, Chicago, Ill. Filed Aug. 24, 1899.

653,472. Controller for Dynamos or Generators. Henry H. Cutler, Milwaukee, Wis. Original application filed Aug. 24, 1899. Divided and this application filed Jan. 29, 1900.

653,531. Machine for Grinding Carbon Diaphragms. Charles T. Richmond and Mahlon M. Zellers, Cleveland, O., assignors to the National Carbon Company, Trenton, N. J. Filed July 10, 1899.

653,636. Power Transmitting Device. David Ashman, Baltimore, Md., assignor to Eagle Manufacturing Company. Filed Jan. 25, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

653,319. Supervisory and Busy-Test Appliance for Telephone-Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 3, 1898.

653,422. Telephone-Test Set. Albert C. Ludington, Marquette, Mich., assignor of one half to Nathan M. Kaufman, same place. Filed Jan. 18, 1900.

SIGNALS AND SIGNALING APPARATUS.

653,469. Electric Signaling Apparatus. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed March 16, 1900.

MISCELLANEOUS.

653,221. Electric-Traction Balloon. Marie J. A. Deydier, Nyons, France. Filed Aug. 11, 1898.

653,231. Case for Phonograph-Records. Josephine Gilgen and Gertrude Gilgen, Chicago, Ill. Filed March 17, 1900.

653,343. Electrostatic Separation. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Filed Dec. 2, 1899.

653,344. Diamagnetic Separation. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Filed Dec. 2, 1899.

653,383. Apparatus for Making Radiographs. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Filed Sept. 26, 1898.

653,448. Reel or Spool for Electric Thermostatic Cables. John D. Gould, New York City. Filed July 10, 1899.

653,530. Voltaic Cell. Charles T. Richmond, Cleveland, O., assignor to the National Carbon Company, same place. Filed Oct. 9, 1897.

653,538. Electrolytic Apparatus. Nathaniel L. Turner, Salmon City, Idaho. Filed June 7, 1899.

653,585. Contact-Brush. Samuel L. Neely, Pierron, Ill., assignor of one-half to Henry F. Knebel, same place. Filed Oct. 23, 1899.

653,590. Primary Battery. Edward R. Post, Newburg, N.Y. Filed Feb. 5, 1900.

REISSUE.

11,840. Contact System for Electric Railways. William Grunow, Jr., Bridgeport, Conn., assignor, by direct and mesne assignments, to the McElroy Grunow Electric Railway System, Jersey City, N. J. Filed May 29, 1900. Original No. 631,073, dated Aug. 15, 1899.

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THE TELEPHONE WORLD.

The New Telephone Company.

The National Telephone & Telegraph Company, incorporated at Trenton, N. J., last week, with an authorized capital of $50,000,000, has not yet been formally organized, but it is believed that Joseph B. McCall, who has been the secretary of the Electric Company of America, will be elected president.

Little can be found out at present in regard to the future plans of the company, and the rumor which gained circulation in financial circles as to whether it was a combination of all independent companies outside of the Bell Company cannot be confirmed. So far as can be learned, however, no plans have been made as yet by the incorporators, except that a canvass has been made of Camden, N. J., for subscribers, and nearly 1,000 have already been secured.

The agent of the new company is James E. Hayes, of Camden, who has been the lawyer who has represented all the corporations of the Widener-Elkins syndicate.

Through the researches of Mr. Hayes, it was found that as far back as 1866 there was passed a Federal law which granted to telegraph companies the right to a national charter provided the Government was permitted the use of its lines. Mr. Hayes, in speaking of the matter to a reporter, said:

"The new company has a broader charter than that of the Telephone, Telegraph & Cable Company of America. Previous to July 4, when a new law went into effect, there were two methods of forming telephone and telegraph companies in New Jersey. The first, under the telephone and telegraph act allowed them to do business only in the State of New Jersey. The second, under the general corporation law, allowed them to do business outside of the State of New Jersey, but not within the borders of the State.

"In order to meet this situation three separate corporations have had heretofore to be organized. Two of them which did business exclusively in New Jersey, were the Sea Shore and Delaware River Telephone, Telegraph and Cable Company and the New York and Philadelphia Telephone and Telegraph Company. The Telephone, Telegraph and Cable Company of America was organized under the general corporation law to do business outside of the State.

"The passage of an amended law relating to telephone and telegraph companies has been secured, which enables a company chartered under the laws of the State of New Jersey to do business anywhere in the world. We had under consideration incorporation under the laws of the State of New York, which allowed telephone and telegraph companies to go partly beyond the State's borders. The taxation on $50,000,000 was, however, so enormous that it could not be managed.

"Through an oversight in the New Jersey law it did not go into effect until the constitutional date of operation, on July 1. Immediately I proceeded to organize this corporation under the new law. The meeting to complete the organization of the company has not yet been held. The capital of the National Telephone and Telegraph Company will be all paid up. Of the total amount $100,000 has been subscribed and paid in, with which to commence business.

"As to the scope of the company, I can say that those who have organized the new company are absolutely independent from the Telephone, Telegraph and Cable Company of America. A proposition has been made to the Telephone, Telegraph and Cable Company that is now being considered by the officials of that company, which includes the absorption of the Telephone, Telegraph and Cable Company by the National Company."

Among the directors of the new company are the following: A. Lowdon Snowden, president of the Electric Co. of America; James F. Sullivan, vice-president of the Market Street National Bank of Philadelphia and of the Midvale Steel Co.; Joseph B. McCall, a well-known capitalist; Heulings Lippincott, the New Jersey director, living at Camden, and Harry J. Verner of Philadelphia.

The Long Distance Telephone Company is actively engaged putting up poles along Blue Point avenue, in Blue Point, Suffolk County, N. Y., with a view of connecting the lines with the hotels and boarding houses along that popular thoroughfare. In less than a week all the leading hotels and boarding houses will have telephonic connection with distant places, much to the gratification of the city guests.

The retirement of Captain J. C. Parsons from the Sandusky (O.) Telephone Company to go to the Klondike, created a vacancy in the office of treasurer and in the board of directors. At a meeting of the directors J. C. Hauser was elected treasurer, and C. L. Engels was appointed to the vacant place in the directory.

Judge James M. Thomas, well known as president of the Independent Telephone Association of the United States, has been appointed general manager of the United States Telephone Company, with headquarters at Cleveland, Ohio.

Good Thing for Telephone Companies.

Attorney-General Sheets of Ohio has made a ruling which in effect over-rules the Supreme Court. He holds that telephone boxes shall be appraised at $10 for purposes of taxation, although the court has sustained the contention of former Attorney-General Monnett, that they should be appraised upon the basis of their earning capacity. By the earlier ruling the boxes were valued at not far from $100 each, but Attorney-General Sheets' opinion cuts this appraisement down 90 per cent.

The Supreme Court will not be in session until September 25, by which time a reversal of the Attorney-General would be of no avail.

Two independent long distance telephone companies are fully organized in Missouri, one of which is backed by a capital of $3,000,000 and has already commenced building from St. Louis to ultimately reach Kansas City. Another company for independent long distance service, known as the Interstate Telephone Company, backed by unlimited capital, and designed to be built largely for a trunk line, whereby all the local independent telephone companies of East Kansas and Southwest Missouri will be connected with the same, and thereby give to their subscribers long distance service at a pro rata charge, much cheaper than the charges now made by the old Bell Telephone Company and its lessees. The independent telephone companies are now fully organized to meet not only the competitive fight for the control of the telephone business, which they now have by the loyal support given them by the people everywhere, but they are now entering the field to give the people lower rates for long distance service.

The city of Richmond, Va., recently won another victory in its suit against the Southern Bell Telephone Company. Some years ago the council revoked the charter of the company, and ordered it to remove its poles and wires from the streets. This the company refused to do, and Judge Goff granted an injunction restraining the city from interfering with the company. He claimed that the company was protected by Federal statutes. The Supreme Court reversed Judge Goff, and remanded the case to the lower court to ascertain if the company had any rights under the State statutes or municipal ordinances. Judge Simonton held that it had no such rights. An appeal was taken to the United States Court of Appeals, and Judge Simonton was sustained. The company will appeal again to the Supreme Court of the United States.

The Automatic Telephone Meter Company was organized a short time ago with its principal office at 525 Main street, East Orange, N. J. The objects of the corporation are to acquire by purchase or otherwise the inventions of Newman H. Holland and Donald M. Bliss on an improvement for a telephone metering device; to apply for and obtain any and all inventions used in connection with or obtained under letters patent of this country or elsewhere, and to manufacture and deal in automatic or other apparatus and appliances for measuring service of telephones. The capital stock is $125,000. The incorporators are Charles Bate, Walter Fairchild and E. J. MuNulty. The existence of the corporation shall continue for ninety-nine years.

A telephone company, which will erect a line from Cross Fork to Galeton, Potter County, Pa., there to connect with the long distance system of the New York & Pennsylvania Telephone & Telegraph Company, has been organized at Cross Fork, with the following officers: President, E. Peltz; secretary, Martin Gorman; executive committee: E. C. Armstrong, F. W. Peck, all of Cross Fork; Herman Schwarzenbach and Otto Braun, of Germania, and Philip Meine, of Galeton. The company proposes building a telephone line via Oleona, New Bergen, Germania and Germania Station to Galeton. The line will be twenty-seven miles long, exclusive of a branch extending from Germania Station to Corbett, Pa.

It is estimated that there are over 1,000 union business houses and manufacturing establishments in Buffalo, N. Y., that are using Bell telephones. During the next three weeks committees appointed by the United Trades and Labor Council of Erie County and the electricians' union, to which the Bell Company's striking linemen belong, will visit these firms and insist on their throwing out their 'phones without further delay.

On Aug. 1 the Bell Telephone Company of Canada, will begin the laying of another telephone cable between Detroit and Windsor. The new cable will have ten circuits and will be laid beside the natural gas pipe.

The Kinloch Long Distance Telephone Company of Missouri, with a capital stock of $300,000, is now licensed to do business in Illinois with a State capital of $75,000.

Much inconvenience has been experienced on Fisher's Island by the breaking of the Southern New England Telephone cable a few weeks ago. The break is supposed to have been caused by friction against the rocky bottom. Captain Scott's tug Cassie, from New London, Conn., with telephone men was engaged several days in attempts to grapple the ends of the cable and reunite them, but after many unsuccessful attempts the work has been abandoned and islanders must await the work of laying a new line, which the telephone officials have decided to do. They are now awaiting its arrival from Boston and will push the work forward rapidly.

There is no place in the United States of anything like the size of Memphis, Tenn., where telephone service is supplied at $2 per month. The rates are lower there than at Louisville, Cincinnati, St. Louis, New Orleans, Denver, etc., to say nothing of Chicago, Boston, New York and the like The telephone rates in Memphis are on a par with Atlanta, Evansville, Indianapolis, Nashville, etc., all of which places are not as large and important as Memphis.

During the next few months the telephone system in Topeka, Kan., will be improved by the addition of 6,000 feet of cable. Manager Bayless says that new 'phones are being put in at the rate of 20 a month. On July 1, 69 new toll lines in Kansas and Missouri were added to the list. Among the towns connected with the system by the new lines are Wichita, Winfield, Arkansas City, Strong City, Sterling and Newton.

The Independent Telephone Company of Battle Creek, Mich., has devised a scheme by which it will be impossible to be swallowed up by the Bell Company, as many of the independent exchanges have been throughout the State. The stockholders have all assigned their stock for a period of three years over to three of the leading stockholders, so that there will be no danger of the Bell people coming in and buying up small stockholders and getting a controlling interest.

The West Penn Long Distance Telephone Company, composed of the same men that control the Pittsburg & Allegheny Telephone Company, has been incorporated in Pennsylvania to operate long distance connections for the parent Pittsburg exchange. It expects to apply for franchises in 27 towns in Western Pennsylvania.

The Attorney-General of Ohio has under consideration the question of exacting a license fee from the Bell Telephone Company. This company, which leases telephone boxes to the Central Union Telephone Company, and takes thousands of dollars out of the State annually, has never secured a certificate from the Secretary of State under the foreign incorporation laws.

The Mayville (N. Y.) Telephone Company has connected its lines with those of Westfield, Portland, Fredonia and Silver Creek, and is now constructing a line, via Hewes and Summerdale that will connect it with the local system of Sherman in a few days.

The Greenville telephone exchange at Greenville, N. C., passed into the hands of the Carolina & Virginia Telephone Company on July 1. The new company, it is said, will put in a new switchboard and make other improvements.

The Independent Telephone Company, a rival organization of the Nebraska Telephone Company of Nebraska City, Neb., which commenced business about a year ago, has been sold to a number of local business men.

The Central Union Telephone Company of Illinois has filed a mortgage of $1,000,000 in favor of the Old Colony Trust Company of Massachusetts. The telephone company has acquired more property and has arranged for a bond issue.

The Southern Bell Telephone Company has lately completed its long distance line to Midville, Ga., which puts that place into communication with every section where the Southern Bell is operated.

A recent incorporation known as the North Salem Telephone Company will erect a line from Purdy's Station to North Salem in Westchester County, New York.

The Central New York Telephone & Telegraph Company is constructing a double metallic circuit between Rome and Camden.

The Chicago Telephone Company's personal property assessment in Chicago is $2,450,000.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Alvin, Tex.—W. P. Pittman of Lufkin was recently here looking over the ground with a view of establishing an electric light plant.

Ashland, Ill.—The city council will soon let the contract for erecting an electric light plant.

Atlanta, Ga.—An ordinance granting to the Atlanta Railway & Power Company the right to operate an electric lighting plant in this city has been concurred in by the board of aldermen.

Augusta, Ga.—The lumber and shingle manufacturing company of the E. E. Foy Manufacturing Company is to put in an electric light plant at its establisment.

Biddeford, Me.—The York Light & Power Company will improve its plant at a cost of about $76,000. E. J. Sullivan, superintendent.

Bonham, Tex.—T. C. Bradley, mayor of this city, wants information regarding the establishment of a $15,000 electric light plant.

Brasil, Ind.—This city contemplates the erection of a municipal electric lighting plant after the present contract with the Brazil Electric Light Company expires, which will be in 18 months.

Casselton, N. D.—The electric light plant here is to be enlarged.

Charleston, W. Va.—The city council recently took the preliminary steps toward the erection of a new electric light plant to be owned and operated by the city. The matter of the cost of the plant is to be looked into and an ordinance drawn submitting to the vote of the people the question of issuing bonds to the amount of $25,000 or $30,000.

Chicago, Ill.—The Economic Light, Heat & Power Company of this city was recently incorporated for $10,000 by E. C. Wetten and D. T. Campbell.—Plans for the utilization of the Bridgeport dumping station as an electric lighting plant after the drainage board is through with it are being made by City Electrician Ellicott.

Cornucopia, Ore.—An electric light plant will be put in at the Cornucopia mines in Union County. The waters of Pine Creek will be utilized to operate the machinery. Work on the same will begin immediately.

Delray, Mich. — The citizens are about to vote on a proposition to bond the village for $50,000 to build an electric lighting plant, which will also furnish power in case of fire.

Denver, Col.—The electric light plant of Flint & Lomax was destroyed in a recent fire, entailing a loss of $75,000.

Detroit, Mich.—The executive committee of the reorganized public lighting commission will recommend extensive improvements to the city lighting plant. New machinery is to be installed.

East Orange, N. J.—The city council recently decided to have an ordinance prepared providing for placing all electric wires underground. This is a result of the controversy between the city and the People's Light and Power Company, which has no franchise here, but has strung wires to various places without permission.

Fairport, N. Y.—The board of light commissioners has let the contract for the boiler and engine for the new electric light plant, and it is expected that the contract for the generator will be awarded soon. The plant will be completed about October 1.

Fargo, N. D.—William Mainland, secretary of the Sutherland Construction Company of New York, who represents the new interests in the Fargo Gas and Electric Company is here looking after the preliminary arrangements for the improvements to be made by the company this fall.

Fredericksburg, Md.—This city will erect its own electric light plant.

Fulton, W. Va.—It is rumored that prominent northern capitalists will erect an electrical plant in Fulton to supply the merchants and business houses with fans, motors, etc.

Galena, Ill.—The city council recently decided to advertise for bids for the erection of a municipal electric light plant.

Granite, Ore.—This place will soon have electric lights.

Grosse Point, Mich.—The lighting plant of this village is entirely inadequate for the purpose, and a petition is being circulated asking the council to call an election to vote on the question of voting bonds for a larger plant.

Hammonton, N. J.—The Hammonton-Coater Company has applied to the council for a franchise to erect an electric light plant.

Hedrick, Ia.—At a recent election it was voted to build a municipal electric lighting plant. W. D. Martin, clerk.

Hinckley, Ill.—F. C. Patton of Sycamore is considering the erection of an electric light plant here.

Howell, Mich. — The citizens have voted to issue $15,000 bonds to build an electric light plant.

Jacksonville, Fla.—The capacity of the city electric plant for incandescent illumination has been reached, and, according to Superintendent R. N. Ellis of that department, there is urgent need for an increase in the producing capacity of the plant. It is essential that the extension shall be made at once, to meet the constant demand from commercial custom and to prepare for the necessities of next winter.

Jamestown, N. Y.—The board of aldermen recently voted to expend between $8,000 and $9,000 in improving this city's electric light plant.

Mountain Lake Park, Md.—The board of directors of the Mountain Lake Park Association, met recently and awarded the contract for the electric light and water to the Mountain Lake Park Electric Light & Water Company for two years.

New Orleans, La.—A bill has lately been enacted into a law by the general assembly, authorizing the draining commission of this city to employ the electric light and power plant of the commission in the production of light for the public illumination of the city.

Norfolk, N. Y.—C. A. King contemplates the erection of a dam at Spotswood and will build an electric light plant.

Norfolk, Va.—The Norfolk, Heat, Light & Power Company, controlled by Philadelphia capitalists, has decided to issue $500,000 in bonds. Electricity will be furnished in competition with the Norfolk Railway & Light Company, controlled by the Lancaster-Williams syndicate, which has heretofore monopolized this field.

North Amherst, O.—The city council wants some electrical manufacturing concern to furnish an estimate for an electric light plant. Address City Clerk, North Amherst, O.

Petersburg, Va.—The Southside Railway & Development Company will make improvements amounting to $25,000 at its electric light works.

Redkey, Ind.—The town trustees are securing plans, etc., for erecting an electric light plant.

Rochelle, Ill.—This city will purchase a new dynamo for its electric light plant which was lately damaged by lightning.

Saint Anne, Ill. — The electric light plant at this place was recently destroyed by fire. The loss is estimated at $35,000.

Syracuse, N. Y.—New machinery costing $500,000, lately added to the plant of the Electric Light & Power Company of this city, was tested last week and found to work perfectly.

Tamaqua, Pa.—The taxpayers of this place will vote at a special election upon the proposition to increase the borough indebtedness to the sum of $25,000 for the erection of a municipal electric light plant.

Tiffin, O.—Bids are asked until July 30 for furnishing and maintaining 160 2,000 c.p. and 250 1,200 c.p. arc lights. Address J. B. Ehrenfried, clerk.

York, Pa.—Several local and out-of-town capitalists will in the near future organize a new electric light company in this city. The new plant will be located in the eastern section of the city, along the line of the Pennsylvania Railroad. They propose capitalizing the company at $100,000.

STREET RAILWAYS

Albany, N. Y.—The State Board of Railroad Commissioners recently arranged for a hearing on August 1 at the Fifth Avenue Hotel, on the application of the New York & Brooklyn Union Transportation Company and the New York, Brooklyn & Jersey City Rapid Transit Company.

Brooklyn, N. Y.—The Brooklyn Rapid Transit Company has completed the third-rail system on the Kings County Elevated Railroad and electricity will be used in oporating the trains in a few days.

Conneaut, O.—The Pennsylvania & Ohio Electric Railway will extend its line from Conneaut to Erie before the extension is made to Ashtabula.

Elizabeth, N. J.—The board of freeholders recently awarded to John Kean a franchise for a trolley railroad extension from this city to Cranford for $73,000.

Elkton, Md.—The Cherry Hill, Elkton & Chesapeake City trolley road is now an assured fact, the entire capital stock of the company having been subscribed by Deegan & Co. of Philadelphia.

Evansville, Ind.—W. S. Henning of Dayton, O., who is building an electric line from this city to Boonville, has announced he will build a line from Evansville to New Harmony by way of Mt. Vernon.

Flint, Mich.—Judge Taylor of this city announces that the electric line from Saginaw via Flint to Pontiac will be under construction within 30 days. The line will cost $1,000,000.

Hellertown, Pa.—A trolley road is to be built from here to Doylestown, Bucks County.

Jeffersonville, Ky.—Capt. Ed. Howard, who owns Arctic Springs, is planning to spend about $12,000 in making a park at that place. He will run an electric line from this city to the park and has secured the right of way over the land lying immediately north of Utica pike.

Lenox, Mass.—The survey for the trolley route from Pittsfield to this city was recently completed.

New Haven, Conn.—The Moodus & East Hampton Electric Railway Company and the Mutual Construction Company was incorporated last week. The line will be extended along the bank of the Connecticut River.

Rochester, N. Y.—Calvin Hotchkiss and James D. Bashford, who own a franchise for electric light, heat and power, will soon begin a trolley line to connect this city with Sodus Bay.

Shelbyville, Ill.—The Harvey City & Southern Electric Railroad Company was recently incorporated for the purpose of constructing a road from Harvey City to this place. The concern is capitalized at $150,000. Among those interested are J. Smith Butrum, of Decatur; R. B. Hennigh of Prairie Home, and R. H. Woodword, of Macon.

St. Louis, Mo.—A bill was recently introduced in the city council authorizing the St. Louis & Illinois Electric Railway Company to build lines on several streets in this city. T. Meyer and A. H. Smith are interested.

Warren, O.—A. A. Anderson, manager of the Mahoning Valley electric lines, lately applied to the commissioners here for a franchise for a line from this city to Andersonville. The new line will be 6 miles long.

Woodbury, Pa.—After considerable agitation and some opposition, the proposed trolley road to National Park is now positively assured.

MANUFACTURING.

Ansonia, Conn.—The National Electrical Manufacturing Company has secured a contract for placing a complete electrical fire alarm system in West Haven, including a tower station and 20 boxes, and with electro-mechanical gongs in the fire house for the use of officers of the department. The contract was secured in competition with three other manufacturers, and the National people are pleased at their success.

Chicago, Ill.—The General Electrical Repair Company was recently organized here for the purpose of manufacturing and repairing electrical apparatus. Among those interested are M. Dahl, R. W. Poelma, F. H. Wheeler, all of Chicago.

Taunton, Mass.—The Taunton Locomotive Manufacturing Company recently completed the building of an electric locomotive for the Whitin Machine Company of Whitinsville, Mass., which will be used in moving freight cars on the switch and in the yard of the company.

Zanesville, O.—The Ben Franklin Electrical Company was organized here last week. The purpose of the concern is the manufacture of a combined burglar alarm and home call clock, the patent for which has been secured by Messrs. Fergus and Reed. Among others interested are Joseph Shaw, W. W. Harper, S. A. Weller and Willis Bailey.

COMPANY MATTERS.

Chicago, Ill.—Negotiations are said to be under way in this city for a combination of the Calumet Electric Street Railway, the South Chicago Street Railway, and the Chicago Electric Traction Company.

Plymouth, W. Va.—The Carver Coal Company will build an electric plant for hauling coal.

POWER AND TRANSMISSION PLANTS.

Concord, N. H.—By a recent deal which means much for the future development of the plant of the Concord Land & Water Power Company at Sewall's Falls, the company is to furnish all the electrical energy used by the Boston & Maine Road in the shops at the south end, and to light the corporation's property in this city for a term of five years.

Salem, Ore.—A scheme to utilize the water power at Silver Creek Falls, 25 miles east of here, is being contemplated. There are three waterfalls within a short distance, the highest being 186 feet, and the other two about 150 feet each. The plan is to bring the water from two falls together, and establish there a power plant that will generate enough electricity to supply Silverton, Woodburn and other nearby towns.

Santa Cruz, Cal.—The Big Creek Power Company will shortly make application for a franchise to furnish electrical power to San Jose.

Schoharie, N. Y.—Work on the big enterprise of the Empire State Power Company at Schoharie Falls is now progressing rapidly, and the indications are that the plant will be in readiness to begin operations by August 1st.

AUTOMOBILES.

Plainfield, N. J.—The Plainfield Automobile Company, capitalized at $100,000, was organized last week. The promoters of the scheme plan to provide a public transit service in sections of the city not accommodated by trolley car lines. The incorporators of the concern are Mayor George Rockfellow, of Plainfield; Mayor N. B. Smalley, of North Plainfield; S. D. Drake, E. M. French, D. M. Smalley, and Craig A. Marsh. The automobiles will carry ten persons each, and the fare will be 10 cents.

Philadelphia, Pa.—The patents of the General Electric Auto Company of this city, sold at auction lately, were bought by James W. Cunningham for $29,000.

Salt Lake City, Utah.—Representatives of the new Electric Vehicle Company placed the first carriage on the streets of this city about ten days ago.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—July 16.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1½ % Q.,	124	125
Allentown Pa.—July 16:						
Allentown & Lehigh Val. Trac. Co.		4,000,000	1,500,000	....	..	15
Bridgeport, Conn—July 16:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	105	...
Baltimore Md.—July 16						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	23	23½
Boston, Mass.—July 16						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	...
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,100,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	139	140
Brooklyn N. Y.—July 16:						
Brooklyn City Ry	100	2,000,000	1,923,400	....	229	230
Brooklyn Rap. Transit Co., tr certf.	100	43,000,000	43,000,000	....	51¼	51⅞
cBrooklyn Heights Railroad	....	200,000	200,000	....	107	109
*dBrooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	257	289
eBrooklyn, Queens Co. & Sub. RR	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	320	825
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
fAtlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
gBrooklyn, B. & W. E. Railroad	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—July 16						
Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.—July 16:						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	25	28
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	83	88
Charleston, S. C.—July 16						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—July 16						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	252	253
Chicago & South Side R. T. RR	100	10,323,800	10,823,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000		10	10½
Metropolitan West Side Elev. Ry	100	15,000,000	7,000,000	Feb 28 1900.	27	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	77	78
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
hNorth Chicago City RR	100	500,000	249,900	....	..	..
South Chicago City Railway	100	2,000,000	1,603,200	....	..	..
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	103	103½
Union Traction Ry.............com.	....	1,250,000	624,900	35 %	17	18
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	64	67½
Cincinnati, Ohio.—July 16:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
lCincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	26½	127
Cleveland, Ohio.—July 16						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99	87	87½
Detroit, Mich.—July 16:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—July 16:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	..	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore The pref stock of U R & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—July 16.						
Hartford Street Ry. Co	100	$4,000,000	$200,000	3 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	..	–
Holyoke Mass.—July 19						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—July 16						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind—July 16.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	21	24½
Lancaster, Pa.—July 16						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	..	–
Lancaster & Col. Electric Ry	....	....	87,500	....	..	–
West End Street Railway	....	....	....	....	..	–
Louisville, Ky.—July 16						
Louisville Ry...............com.	100	4,000,000	8,500,000	1¼ %., April.	78	79
Louisville Ry...............pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1.	110	111
Minneapolis, Minn.—July 16						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %. Oct.	136	137
Montreal, Canada.—July 16						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	260	261
Toronto Street Ry. Co	100	6,000,000	6,000,000	1¼ % S., J. & J. †	100¾	100½
Memphis Tenn.—July 16:						
Memphis Street Railway Co	100	500,000	500,000	....	25	–
New Haven, Conn.—July 16:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	–
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—July 16						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
aCrescent City RR...........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
bNew Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—July 16:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	270	300
cChristopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	178	184½
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	100	125
dMetropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	149½	149¼
eBleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	35	37
fBroadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	230	240
gCen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	199	201
hEighth Avenue RR	100	1,000,000	1,000,000	....	375	425
i42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	395	410
jNinth Avenue RR...........guar.	100	800,000	800,000	....	198	205
kSixth Avenue RR...........guar	100	2,000,000	2,000,000	....	203	210
lTwenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	425
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110½
m42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	50	60
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—July 16:						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	....	58	59
North Jersey Railway Co	100	6,000,000	6,000,000	....	26¼	26¾
United Elec. Co. of New Jersey	100	504,000	504,000	11¼ % A.	19¾	20½
Pittsburg, Pa.—July 16:						
Allegheny Traction Co	50	500,000	500,000	....	55	56
oConsolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	24½	24¾
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	63½	64½
pCentral Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
qCitizens' Traction Co	50	8,000,000	‡3,000,000	6 % A.	72¼	72½
rDuquesne Traction Co	50	8,000,000	‡3,000,000	6 % A.	..	...
sPittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co	50	8,000,000	‖2,994,839	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co...........com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co...........pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.–July 16						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass.–July 16						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.–July 16:						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.–July 16.						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.–July 16 :						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.–July 16						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡583,900	3 % S–July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co ... $12½ pd	50	30,000 000	29,980,450	....	83	8¾
bElectric Traction Co	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A–Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share–1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	96	96¼
jCatherine & Bainbridge St	50	....	‖400,000	6 % A–Mar., '98.	...	..
jContinental Pass. Ry....guar.	50	1,000,000	‖580,000	$6 share–July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.–July 16						
Rochester Railway Co	100	5,000,000	5,000,000	....	16	17
Reading, Pa.–July 16						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	183	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	..
St. Louis Mo.–July 16.						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	..
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR	50	2,400,000	2,800,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry....com.	50	500,000	500,000	....	20¼	21
United Electric Ry.....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	69	71
t. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99	..	..
San Francisco, Cal.–June.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR	100	1,000,000	550,000	....	..	16
Scranton Pa.–July 16						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
mScranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
mScranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	..	..
Springfield Ill.–July 16						
Springfield Consolidated Ry	100	750,000	750,000	....	--	..
Springfield O.–July 16						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.–July 16						
pringfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.–July 16.						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ‡	100	100½
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.–July 16.						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	104¼	105
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	15	16
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	..	..
Worcester, Mass.–July 16						
*Worcester Traction Co.....com.	100	8,000,000	8,000,000	....	23	28½
*Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb., '98.	104½	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.–July 16:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866–7–8 p.a. $20,000 in 1899–1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.–July 16						
American Bell Telephone Co	100	50,000,000	23,660,000	4½ % Q., Jan.	298	300
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	105¼	107½
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	18	181
New York.–July 16						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	104	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co.......2½ % guar.	100	1,000,000	......	1¼ % S.	42	53
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	112	118
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	118	123
*International Ocean Tel Co. guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co	100	5,000,000	3,723,000	2½ % Q., Jan., '99.	168	174
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	130	134
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79¾	80
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.–July 16 :						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co	100	......	......	....	61	66
Chicago Telephone Co	100	......	......	....	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	79	80
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¼ % Q.	122	125
Providence (R. I.) Teleph. Co	50	.... .	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.–July 16:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	131	131½
T.-H. Elec. Co..T. Secur., Series D.	..	......	......	....	77	77½
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	48	45
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	62½
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44	44½
New York.–July 16:						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,983,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	..	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co....com.	..	......	......	....	82	92
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new]... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900.	131	131½
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	..
‖Kings Co. El. L. & P. Co	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa.–July 16						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.–July 16						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	75	80
Northern Elec. Light & Power Co	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co	10	187,500	187,500	....	30	--
Miscellaneous.–July 16						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	10	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	150	155
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98	100
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q ‡	201	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	181	182¾
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 96.	..	100
Woonsocket (R. I.) Electric Co	100	.....	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex-div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.–July 16:						
American Electric Heating Co	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 26, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.–July 16 :						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co....com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co....pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.–July 16						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	2½	8
United Gas Improvement Co..scrip.	50	10,000,000	......	----	..	162
Welsbach Commercial Co....com.	100	8,500,000	......	----	22	23
Welsbach Commercial Co....pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	42	44
Welsbach Light Co., Canada	5	500,000	......	....	1¾	1⅝
Pittsburg, Pa.–July 16						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.–July 16						
*Barney & Smith Car Co....com.	100	......	1,000,000	----	18	16
*Barney & Smith Car Co....pfd.	100	......	2,500,000	2 %	95	100
Billings & Spencer Co	25	......	......	....	82	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	60	62
Johns-Pratt Co	100	....	....	----	105	109
*Pratt & Whitney Co....com.	100	......	....	----	2	4
*Pratt & Whitney Co....pfd	100	....	......	----	40	50
Stillwell-Bierce Co....com.	--	....	....	----	..	50
Stillwell-Bierce Co....pfd.	..	....	....	2 % Sept 1, '99.	70	65
Shultz Belting Co	[illegible]	500,000	......	....	80	90
St. Charles Car Co	-	....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—July 1 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	*117½	119½
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR.1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—July 16, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
†Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	113⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co.No. Balto div.1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M.& N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	... .	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
'Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	531,000	531,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation- July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Juyl 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M& N	109	......
Winchester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M& S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s.	$150,000	‡$150,000	1912	‡M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	‡M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	8,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000.000	5,181,000	1945	....	109½	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	930,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100.000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200.000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,035,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—July 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	300,000	1908	M. & S.		
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.		

†$35,000 per m. single track authorised $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—July 16, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry...................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry...........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	... .	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co.........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	....	.....
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	....	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	.....	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—July 16, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......5s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	375,000	375,000	1930	J. & J.	....	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co...........1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	..	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500.000	2,033,000	1934	J. & D.	...	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1919	M. & S.	...	....

Providence R. I.

Date of Quotation- Juyl 16, 19 00.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	.....	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Juyl 16, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,080	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s.	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter...1st	1 000 900	000 000	191	J& J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—July 16, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1906	M. & N.	108	105
Lindell Ry. Co......................1st mtg. 5s	1,600,000	1,600,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal. *Date of Quotation*—June, 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C. *Date of Quotation*—July 16, 1900						
Belt Ry. Co.......................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous. *Date of Quotation*—July 16, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	....
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. St. RR. Co.						
‖$87,000 in treasury.						
§$960,000 res'ved to redeem prior liens.						
††$620,000 in escrow.					*With int'rest	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—July 16 1900.						
Delaware Gas Lt. Co.,........1st m. 5s. g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—July 16, 1900						
Allegheny County Light Co..............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(July 16, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	[illegible]	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000		1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	[illegible]	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—July 16, 1900.					100½	101
American Bell Telephone.....................4s.			1908	F. & A.	......	.. .
Northwestern Telegraph Co..................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	1'4	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	103	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—July 16, 1900.						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.		....	1904	J & D.	......	......
Worthington Pump Co...........................	75,000	....	......	....	115	127
Unlisted †Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16½@16¾c.; casting, 16@16½c.

The Trenton, N. J., Street Railway Company has advanced all wages 15 cents a day.

The United Traction Company, of Albany, has declared the usual 1½ per cent. quarterly dividend.

The pool which has recently been working in Brooklyn Rapid Transit is said to consis principally of A. N. Brady, Thomas F. Ryan, W. C. Whitney and their associates.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 16½@17½; New York Electric Vehicle Transportation, 6⅞@7; New England Transportation, 3¼@4¼; Gramophone, 30@40.

At the regular meeting of the New England Street Railway Company it was decided to pass the regular quarterly dividend of 1½ per cent. and devote the dividend, amounting to about $5,500, to the debt of the company.

The Siemens & Halske Electric Company has sold to Robert McAllister Lloyd and Walter H. Johnson of New York City six blocks at the northwest corner of West Sixteenth street and Robinson avenue, in the township of Cicero, near Chicago.

The Worcester (Mass.) Electric Light Company is to begin to declare dividends at the rate of 10 per cent. per annum. The first quarterly dividend of 2½ per cent. will be paid October 1 on the $400,000 of stock, including the new issue of $100,000.

Telephone stocks are selling in Boston on nearly an equal income basis, American Telephone and Telegraph Company at 145 nets the investor 5 17 per cent.; Erie Telephone Company at 88 nets 5 10 per cent, and New England Telephone at 120 nets 5 per cent.

The stockholders of the electric railway to be built along the Ridge road between Buffalo and Rochester, N. Y., will soon meet and consider the advisability of increasing the capital stock from $1,250,000 to $2,500,000. The survey of the road has been completed.

The Knickerbocker Trust Company of New York has brought suit in the United States Court asking for the foreclosure of a mortgage against the Lakeside Street Railroad Company, of Ft. Wayne, Ind., and for the appointment of a receiver and the sale of the company's property.

The minority stockholders of the Southern Electric Railroad of St. Louis, have brought suit, through the State Attorney General, to annul the purchase of the road by the St. Louis Transit Company. The case is a test one and, if won, may break up the St. Louis Transit "deal."

Two heavy mortgages were filed last week in the office of the clerk of the superior court in Atlanta, Ga., to secure bond issues amounting in the aggregate to $3,000,000. One mortgage was made by the Atlanta Rapid Transit Company to secure bonds amounting to $1,000,000. The other was by the Georgia Electric Light Company to secure $2,000,000 of bonds.

W. E. Barrows, president of the Welsbach Light Company, which has been merged into the Welsbach Company, reports for the fiscal year ending April 30 net earnings amounting to $416,910. The dividends paid amounted to $206,406 and there was charged to depreciation and patent litigation $87,763, leaving a surplus of $210,504. Directors were elected last week but action upon dissolution of the company was deferred for the present. The company's net earnings in 1899 were $410,417; in 1898 they were $475,267 and in 1897 $463,677.

The annual report of the directors of the Canadian Electric Company at the meeting of the shareholders held in the city of Quebec, showed that the development works of the company were well advanced and would probably be completed by the end of next September Contracts have already been made for 3,000 lights, and it is expected that operations will be commenced with a lighting load of about 6,000 lights. Negotiations were in progress for lighting the streets of Levis, Que., and applications have been received from several manufacturing concerns for power.

A plan for combining the Calumet Electric Street Railway of Chicago, the South Chicago Street Railway and the Chicago Electric Traction Company has been revived. It is presumed that the application recently made for the appointment of a receiver for the Chicago Electric Traction Company is preliminary to the consolidation. Persons who are interested in the plan decline to say anything about it, but that negotiations are under way for the combination of the three properties is admitted. The combined roads operate nearly 150 miles and represent an investment of $7,000,000 to $8,000,000. Boston and New York parties are supposed to be interested in the deal.

The annual meeting of the Chicago Union Traction Company will be held in Chicago next Tuesday. The directors, as the board is now made up, are Chicago men, the Eastern interests having arranged for such representation to give the road greater strength in its own locality. Inside interests state that the cutting down of the North Chicago earnings, through the competition of the Northwestern Elevated Company (C. T. Yerkes' line), will be overcome as soon as the novelty of the elevated road wears off. In the month of June the North Chicago earnings compared with a year ago, decreased $39,714, while the West Chicago increased $8,377, a net decrease of $31,337.

Judge Shipman of the United States Court, New York, has rendered a far-reaching decision in the suit of John A. Brill, president of the J. G. Brill Co., of Philadelphia vs. the Third Avenue Railroad Company. The Third Avenue Company purchased in 1894 and 1895 from the Bemis Company of Springfield, Mass., 180 car trucks in which were employed elleptical springs. Mr. Brill was granted a patent for this type of truck in 1892. The court held that these trucks were an infringement of the Brill patent and ordered a decree with costs, ordered an accounting for damages and profits and issued an injunction restraining further infringement. Nearly all of the single trucks made in the country since the early 90s have this construction, hence the far-reaching effect of the decision.

President Rossiter's statement relative to the earnings of the Brooklyn Rapid Transit Company for the fiscal year ending June 30 is encouraging. He said: "The earnings of the Brooklyn Rapid Transit Company for the past year are satisfactory—the largest made in the history of the road. The annual report, which is now in course of preparation, will be filed ahead of the time prescribed for such action. The exact figures will not be made public until the report is completed, and I will make no estimates." Mr. Rossiter also said that this week he expected "to abolish steam power upon the Kings County Elevated Railroad as far as East New York, and upon the Lexington Avenue line, and to run the cars by electric motors." He added that he expected "from the present outlook to run the Kings County cars over the Brooklyn Bridge in a month or six weeks. With the new arrangement in force, two thirds of the Brooklyn Elevated system would use electricity as a motive power. The lines unequipped are the Myrtle Avenue and the Broadway. The company is laying the third rail upon these lines, so that it is a question of only a few months before the whole Brooklyn elevated system will be operated by electricity."

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ELECTRICITY.

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EDITORIAL NOTES.

General Electric Company Increases Its Capital Stock.

A special meeting of the stockholders of the General Electric Company took place at Schenectady, N. Y., on July 17. The object of the meeting was to vote on a proposition to increase the capital stock by $4,415,000 to retire outstanding debenture bonds. There were present 153,000 out of a total of 208,272 shares. The issue of 44,150 additional common shares was duly authorized, which brings the total capitalization of the company to $25,242,200, consisting of 25,512 shares of preferred stock of the par value of $100 each, and 226,910 shares of common stock of the par value of $100 each. As previously stated the new stock will be used for the purpose of retiring the outstanding 5 per cent. gold coupon debenture bonds of the issue of June, 1892. About 50 per cent. of these bonds have from time to time been cancelled, leaving $5,298,000 yet to be taken. It is rumored that the company will offer the new stock to present shareholders at par. It is figured that the rights would give the shareholders about 20 to 25 per cent. on the new stock at par, equivalent at present prices to a dividend of about 7 per cent. It is further suggested that this would be nothing more than right to the stockholders, inasmuch as out of earnings aggregating some 25 per cent. in 1899, stockholders received only 6 per cent., and the business so far for 1900 is claimed to be fully holding its own.

* * *

New Types of Electric Elevators.

Electric elevators for both office buildings and private residences are coming more and more into use, and are fast crowding out the hydraulic type that was so popular a few years ago.

In high office buildings and in hotels the elevator is just as necessary as the plumbing system, but up to now means for conveying persons from one story to another has not been extensively adopted in private residences—excepting those belonging to the very wealthy—owing principally to the expense which such a system entails. In a recent issue of the New York "Record and Guide" it is pointed out that now, however, architects and builders are making provision in their designs for new private residences for an elevator shaft, whether the first tenant desires an elevator or not. This is due to a great extent to the fact that several comparatively simple and inexpensive elevator systems have been devised of late which may be installed in a private residence for a few thousand dollars, and which do not require the constant service of an attendant. The paper already referred to says:

"A recent improvement which particularly adapts the electric elevator to residences is a system of push-buttons by which the elevator can be operated with the utmost precision and safety, and which makes an attendant unnecessary. A push-button is placed in every hallway landing, and inside the car a button numbered to correspond with each floor and also a safety button are placed. By pressing any one of the hallway buttons the elevator will ascend or descend to that floor, stopping automatically at the landing. By pressing the button inside the car, which corresponds with the floor it is desired to stop at, the elevator will proceed to that floor, stopping of itself at the landing. By pressing the safety button inside the car, the elevator can be brought to a stop immediately. To give the operator in the car full control, the hallway buttons are made inoperative while the car is in motion. For greater safety, the modern devices that prevent any door being opened until the car has come to a stop opposite that door, and that prevent the car being moved until every door in the shaft has been securely closed, are important features. The ordinary location of the elevator shaft in American basement residences is just back of the upper landings of the stairs, a place commonly occupied by closets or ventilating shafts in the old high-stoop-houses."

The cost of running such an elevator depends of course upon the loads carried, but is said to average about ¼ cent. a trip, the current for its operation being taken directly from the street main, as in the case of lighting. Once in working order, there is no other expense than this, an occasional oiling of the machine being the only attention necessary. Thus it will be seen that an elevator system of this type is easily within the reach of persons of moderate means.

Another type of electric elevator, recently patented by two residents of Wellston, O., has for its object the simplification of the construction and relative arrangement of the motor and co-operating parts which lift the

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car. In this system all the operating appliances are placed on the car, there being no drum or cable arrangement by which the car is lifted.

Through the center of the elevator well a vertical screw threaded shaft is suspended, being held securely at either end to prevent rotation. At the top of the car and surrounding the shaft is an electric motor, which is directly connected to an elongated nut, the latter being threaded internally to fit the threads of the shaft. When the current is turned on by means of a controller on the car, the nut is supposed to revolve on the shaft and lift the car to the desired floor. The inventors claim that any danger of the car dropping is entirely eliminated, for when the armature of the motor is at rest it forms an efficient lock, by which the car is held in a fixed position. To prevent the car from striking against the top or bottom of the well, should the operator neglect to cut off the power, the ends of the shaft are made smooth at a certain point, thereby removing all danger of crushing the car and its occupants. What would happen were the armature to burn out or otherwise become deranged, and whether any provision has been made for such a contingency is not stated.

* * *

An Experiment Looking to the Abolishment of the Centralized Labor System. An attempt is about to be made near Budapest, Hungary, by the Ungarische Elektricitäts Allgemeine Gesellschaft and the Budapester Allgemeine Elektricitäts Gesellschaft to abolish the factory system by supplying cottages and homesteads with cheap electric power for the running of light machinery. This, it is thought, may possibly be the solution of an economic problem that has been troubling industrial economists for some time. Treating of this subject the London "Electrician" says:

"The feasibility of this as an alternative to the existing factory system has more than once been advanced by prominent economists in this country. Lord Salisbury, for example, has on several occasions expressed the opinion that the advent of electric power would revolutionize industrial methods, decentralizing industry from the factory to the home. On the other hand, it has been shown that the factor of cheap power is not the sole consideration, nor indeed the principal consideration, in determining whether an industry should be carried on in a factory or in a number of isolated homesteads. Other considerations, such as the distribution of the raw material and the collection of the finished products, enormously affect the question."

It might also be added that as a general rule more and better work can be obtained from a body of men or women working under the direct supervision of a competent superintendent than were the working force scattered in all directions and necessarily more or less dependent on their own judgment. Furthermore, at a factory there is as a rule little opportunity of having their attention taken from their work, whereas at home there would be very apt to be unavoidable interruptions.

This system has been tried, if we are not mistaken, in a certain section of France, with what result, however, we are not prepared to say. As our contemporary intimates, therefore, it will be interesting to see what degree of success is effected with the Hungarian experiment.

Electro-Culture. For several years now experiments have been carried on in various localities with a view to ascertaining exactly what effect an electric current has on plant life. At the electro-culture experimental station in Amherst, Mass., electricity has been applied to beets, radishes, flowers and fruits with very satisfactory results, which we referred to in these columns some years ago. At that time it was pointed out by the use of the electric current, beets that formerly yielded 18 to 20 per cent. of sugar were made to yield 25 to 30 per cent. That flowers subjected to the action of the electric current grew more rapidly and gave forth more fragrance than those grown in the ordinary way. This is accounted for by the fact that the electric current in passing through the soil liberates the nitrogen which is eagerly sought for by the plants, owing to its fertilizing qualities.

In view of the results obtained at Amherst, a series of experiments recently carried on in Russia will prove of interest. The latter experiments were started on three different lines, M. Spyeshneff repeating well known experiments on electrified seeds, confirmed the belief already existing that such seeds germinate more rapidly and give better crops—from two and one-half to six times higher—than seeds that have not been submitted to preliminary electrification. He next repeated the experiment of Ross—that is, burying in the soil one copper and one zinc plate between which a current of electricity was made to pass. It was found that potatoes and roots grown in the electrified space gave crops three times heavier than those which were grown close by on a test plat. The growth was especially vigorous in the carrot, many of these roots attaining a diameter of from ten to twelve inches. In his third set of experiments Spyeshneff started out on more original lines. He placed on his experimental plat, about ten yards apart, wooden posts surmounted with metallic aigrettes connected by wires, so as to cultivate his plants under a network of wires. One of the striking results obtained was that the growth and ripening of the barley crop was accelerated by twelve days.

Another Russian has just undertaken a series of laboratory experiments upon boxes of soil subjected to electric currents. Observation showed that the temperature of the soil was raised by these currents. Its moisture decreased first, but began to increase after a course of three weeks—the same increase of moisture has been noticed by other investigators. Finally the amount of vegetable matter in the soil was increased by the currents.

As stated on a former occasion when referring to this subject, the effect of electricity on plant life is extremely interesting, but it would seem very doubtful if electric currents as a stimulant will ever be made use of in a practical way by farmers. The cost alone of preparing a large farm would prohibit its use. It might, however, be adopted with advantage in hot-houses, experiments having shown that electro-culture has a beneficial effect on flowers by quickening their growth and strengthening their fragrance.

ELECTRIC headlights for railway locomotives are coming very generally into use in the Western States, and are paying for themselves in saving the railway companies large sums formerly paid for cattle killed on the track.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

DURING an electrical storm Saturday night an open car on the Madison avenue line in New York City was struck by lightning near 83d street. The car was crowded with passengers, huddled together to avoid the rain that was beating in under the blinds and shades, and a scene of wild panic followed. Considerable disturbance was also caused on the 79th street branch circuit of the New York Telephone Company, as all the telephone bells were set violently ringing at the time of the storm. The phenomenon lasted some seconds, and caused scores of anxious householders to make inquiry. Some of the 'phones were burned out.

IT is now known that the New York Central Railroad Company has in contemplation the adoption of some system of motive power other than steam, on that section of its system between the Grand Central station and Mott Haven. The idea is to do away with the running of engines through the Park avenue tunnel. It is expected that electricity will be the power selected.

IT is stated that the Edison electrical gold saving plant is in constant and successful operation on the Ortiz mine grant near Dolores, Col., giving employment to a force of twelve men. The secret of the new process whereby the gold values are rescued from the auriferous gravel and sand of the Ortiz grant without the aid of water, has not been confided to the public. It is still one of the personal private possessions of Thomas A. Edison; but it is evidently more than meeting the expectations of its inventor and his business associates, and little doubt is entertained that it is destined to revolutionize present methods of reducing gold-bearing ores.

ACCORDING to the Automobile Almanac for 1900, there are at present in use in the United States 688 automobiles, or about one-tenth the number in France. United States occupies second place on the list, Belgium being third, with 478; Germany fourth, with 434; Great Britian fifth, with 412, and Austria sixth, with 403.

THE latest published statistics show capital to the amount of $200,000,000 invested in the electrical industry in Germany, not including street car lines and generating plants.

NEXT to making water run up hill, is that of the invention of a gentleman in Montreal, Mr. A. G. Ingalls, a graduate of McGill University in that city. His invention is a process by which water may be used so as to effect an immense saving in the consumption of coal. In fact it may be said that water practically, is the fuel and coal is merely an auxiliary. The method is such that a thin spray of water is spread over a coal flame in such a way, and with such auxiliaries, that the heat of the flame is wonderfully augmented. The full details of the secret are not yet made public by the inventor. The discovery, it is alleged, can be applied to gas and other flames.

THE fire alarm system of Kearny, N. J., has been giving trouble for several months. The mechanism in the boxes failed to work properly and the alarms have sounded in such a way as

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to cause confusion in the fire houses. Last week it was decided to remove the central switchboard in the Highland hose house from the basement to the top floor, under the impression that dampness caused the trouble. When the carpenters took apart a partition in the basement, in a dark corner a hiss was heard, and the next moment a snake measuring 18 inches crawled out of the opening. Two dead snakes were found later in the wheels of the striking apparatus. This explained the trouble. The switchboard and striking mechanism were near one of the cellar windows, in which was a broken pane. It is supposed that the snakes entered the cellar through the window and crawled into the apparatus by way of one of the holes through which the wires run to the switchboard. The alarm now works perfectly.

IN its five months of life, the automobile stage coach and mail line which has been established in Speyer, Germany, has carried 40,000 passengers. Each coach carries twenty-eight passengers. The route is ten miles, and the company has a contract to carry the mails.

THE Royal Society held its annual conversazione in London recently when, as usual, a large and distinguished company assembled to view an interesting collection of scientific appliances and inventions. Of these, perhaps the most remarkable was a clock controlled at a distance by the wireless telegraphy of the Hertzian wave system. The great potentialities of the invention may be understood when it is explained that under the conditions which the exhibitor, Richard Kerr, F. G. S., proposes, it would be possible for the whole of the clocks in London to be simultaneously adjusted by one clock to which the necessary contrivance had been attached. To render a clock sensitive to the influence of the wave system it would be necessary to affix a receiving instrument with a coherer, an arrangement which might be extended not only to the public clocks but to those of private residences. Then by means of a transmitter established at any point of the city it would be possible to adjust every clock in London by the instantaneous pressure of a button.

NEWS from Carthage, Mo., states that an electric ore finder has been attracting a good deal of attention lately in different portions of the country. Capt. Dahlgren of that city says he is confident that it will always indicate it whenever passing over deposits of ore. One can never tell, however, whether it is a lead, jack or mundic deposit. The instrument is so arranged as to indicate the amount of electrical resistance there is in the earth under it. In passing over a limestone bar, the resistance is always high, away up in the thousands sometimes, while it often registers below the hundred mark when placed over large deposits. It is likely that some parties near Carthage are going to try it soon.

THE oiling of machinery in large factories is a laborious and sometimes dangerous task, to say nothing of the chance of missing several oil cups, which give warning later on by sundry squeaks, when it becomes necessary to begin a hunt for the dry bearing. With an oil cup recently patented, all this trouble and damage to the machinery is eliminated. The cups are of large size and are fitted with a pair of electric magnets at one side. When the current is turned into the circuit connecting all the magnets the latter actuate the pivoted bars and pull the plungers out of the openings, allowing the oil to flow to the bearings. On account of the large size of the cups it is only necessary to fill them at long intervals, and a cup in a convenient place can be watched to ascertain the quantity of oil still remaining throughout the circuit. An arrangement can also be made whereby the machinery will automatically close the circuit at intervals, thus making it unnecessary to pay any attention to the oiling process until the cups become empty.

A NEW invention, which is now attracting the attention of some of the largest manufacturers of rubber and electrical goods, is that of "Adirondackite." This new substance is the outcome of much study and chemical experiment by the owner, C. F. Walters, a pharmacist, of Prospect, Oneida County, N. Y., who claims for this new rival of rubber cheapness, and that it is adapted for use in making waterproof articles for wearing apparel of all kinds. It can be used in the place of rubber for belting, or mixed with it, is an excellent insulator of electricity, and can be used for covering copper wires. Owing to its plastic qualities wires so covered can be bent to conform to any angle desired.

AN Associated Press dispatch says that the Strowger Automatic Telephone Exchange of Chicago has been paid $350,000 by the German Government for the patents and rights to manufacture and use the company's automatic switch. A trial of the switch was made in Berlin last January, when the first payment of $150,000 was made.

SECRETARY H. E. CHUBBUCK of the Illinois Electric Association is going to collect a large number of vital statistics from the 200 odd members of the association, which represents practically all of the electric light plants in the State. Mr. Chubbuck has prepared a blank whose queries include the name of the company, names of the officers, its capital stock, a description of the machinery, power and circuits, etc., kind and cost of fuel used, whether the company has any city contract, and if so the prices, the population of the place, and a number of other questions, the whole numbering about thirty. The answers will be used by the secretary for tabulating general facts tending to throw light on the cost and profits of production, etc.

CONSUL GENERAL LAY, of Barcelona writes to the State Department at Washington as follows concerning the Barcelona & San Andres Railway, an electrical system to be built between Barcelona and Horta, a distance of four miles: "I find it very difficult to get any reliable information about projected roads, especially about those for which the equipment is being bought, as the directors, chief engineers and other officials of the new tramways are foreigners, and have their headquarters in other cities. I would suggest, therefore, that our manufacturers write to the Société Anonyme d'Entreprise Generalé de Travaux, Liege, Belgium, in good time before the contracts are let at Brussels. The society is a very large one and has built many miles of tramways in Europe, and is constructing lines in Russia, I understand, at the present time. In connection with the sale of electrical supplies and equipment in Barcelona, I would advise manufacturers of motors not used in connection with tramways and other small electrical appliances that their agents here must keep a certain stock of such articles on hand, as I am informed by several electrical importers of Barcelona that frequently English or German goods are sold because the purchaser cannot wait for better American made articles, which take so long to come from the United States."

RIDING in motor vehicles has become such a popular fad in Westchester County, N.Y., that a number of wealthy men have decided to form an automobile club, which will be composed of motor vehicle owners in New York, Westchester and Connecticut. The name of the club will, it is stated, be decided upon at the next meeting when officers will be elected and by-laws adopted. It is claimed that the new club will not conflict with the New York Automobile Club, but will be a separate and distinct organization. One of its principal purposes will be to provide supply stations along the Albany Post Road, Boston Post Road, the new macadamized boulevards now being constructed through the Bronx and the Hudson River Valleys, and other cross-country roads leading to the Ardsley Casino, Westchester Country Club, and the Knollwood Country Club. At these stations gasoline and naphtha and other materials will be kept, and arrangements will also be made for charging electric machines.

THE Richmond (Va.) Locomotive Works, equipped with the most modern water-tube boiler and Corliss engines, is now making electricity not only for its own use, but for the motive power of its five large moving cranes and all the machines in its wheel and cylinder shop, and its three shearing machines. It is about to install another 100-kilowatt generator for additional electrical power. If, with the best appliances for generating electrical power by steam, the Locomotive Works find it to its advantage to get electricity from the James River Company, it would seem to be conclusive that electricity will supplant steam in less favorably equipped plants. It is thought by those who have studied the subject that in the development of this water power electricity will be of greatest service to all sorts of small enterprises, where a cheap and convenient power is necessary.

AN electric elevator to be operated in connection with the rapid handling of mail matter at the Union Station at Toronto, Ont., is about to be erected. Its dimensions will be 12 x 16 feet, and it will have a run of 20 feet, and be capable of lifting five tons. The elevator cage will be of steel, and the electric winding machinery will be placed upon steel beams resting upon the top of the shaft within which the elevator is to run. It will be equipped with special mechanical and electrical appliances for safety purposes. The intention is to have the elevator hoist and lower the automobiles in which the mail matter will be carried to and from the station.

Joint Meeting of the American Institute and British Institution of Electrical Engineers in Paris.

The following is announced as the title of the subject selected for discussion by the electrical engineers at the meeting in Paris on August 16: "The Relative Advantages of Alternate and Continuous Currents for a General Supply of Electricity, Especially with Regard to Interference with Other Interests."

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NEW YORK STATE BUILDING.

The New York State Building at the Pan-American Exposition, to be held at Buffalo in 1901, is to be an edifice of substantial and enduring character. The architect is Mr. George Cary, of Buffalo. He has chosen for his guidance in the work a Greek temple of the Doric order, adapting his plans to the purposes for which the building is intended. The site chosen is on high ground near Elmwood avenue, overlooking the North Bay of the lake in Delaware Park and near the principal entrance to the Exposition grounds by street cars. The location is not only thus convenient to the electric cars, but one that is fortunate and beautiful as well from every standpoint, so that the building will add to the beauty of this popular pleasure ground. Immediately in front and across the park bay the Albright Art Gallery will stand as a companion piece in the park picture. The building will be used during the Exposition as New York State headquarters, and will contain certain of the State exhibits.

After the Exposition it will become the permanent home of the Buffalo Historical Society, whose large collection of pioneer and other historical relics will be placed therein. The floor area will be three times that now used by the Historical Society in the Build- of the Buffalo Public Library.

The dimensions of the building are 130 x 82 feet, the north front to be 20 feet less than the south. The height is 33 feet on the north and 40 feet on the south walls. The height of the basement is 12 feet, and the second floor walls reach to the roof, making the ceiling 18 feet high. In the basement are janitor's quarters and bicycle rooms (which may be entered at grade from Elmwood avenue), boiler and coal rooms, storage rooms, etc. A dining room containing 1,906 square feet faces the park to the south and opens on the north. On the ground floor is also one of the museum rooms, which communicates with the floor above by a grand staircase. Over 10,000 square feet of floor space is provided for museum purposes. There is also an assembly hall with seats for 300 persons, and a library 37 x 52½ feet. Offices, cloak and other rooms make the total floor area 31,803 feet. Fire proof materials will be used throughout in the construction of the building. The exterior will be stone. There will be no wood except the mahogany doors on the first and second floors and birch in the basement. All the door casings, inside column covering and cornices, are of plaster. All bases are marble and cement. The floors are marble, concrete, granite and wood blocks laid in asphalt. The stairways are of marble and iron. The view of the bay and lake and of the park, which will be seen from the broad columnated portico on the south side of the building, will be of the most beautiful character.

NEW YORK STATE BUILDING

Work Commenced on the Power Canal.

The first sod on the Hamilton and Lake Erie power canal was turned at the town of Silverdale, Ont., on the 18th. inst. Nearly 2,000 people were in attendance. The canal will start at Welland River and run six miles to Jordan village. A diversion canal will be built by which a fall of 225 feet will be secured. The canal will be completed about September 1, 1901. It is claimed that electric power can be produced at this point at a lower rate than at any other point where electricity is developed, as there are no engineering difficulties to be overcome. The installation plant will develop 25,000 horse power, which can be increased to 50,000 or 60,000 horse power as may be required. The canal will be 150 feet wide at the bottom, 12 feet deep, with a current of 3½ miles an hour. The cost of the work is estimated at about $1,000,000.

THE RAILWAY AND THE TELEPHONE.*

BY HENRY W. POPE.

I purpose, within the limits of this paper, to bring especially to your notice the possibilities and ramifications of the telephone, leaving you to theorize as to its availability or adaptability to the various purposes attending railway operations. Its substitution for the Morse system, in the intricate details of the manipulation of traffic, has not been encouraged to any considerable degree, but sufficient progress has been made since the last meeting of this association to warrant the belief that the process of evolution has commenced and that from this time forth the prejudices and uncertainties that have long obtained, in opposition to the introduction of the telephone, will gradually dispel themselves. I am quite confident that the more you investigate, provided, of course, your investigation is along the line of what is considered first-class or standard telephone service, the more you will be convinced of its availability for all the requirements of railway operations and astonished by its greater elasticity, to which I shall particularly refer further on. This latter qualification insures, as a necessary sequence, the most important desideratum—greater safety. Complex situations can be met and determined immediately, without the intervention of third parties, verbal negotiations between the various departments regarding the manipulation of traffic can be carried on with the facility and ease of ordinary conversation, though great distance intervene. To obtain these facilities and accomplish these results naturally involves expense, but the expense bears as little proportion to the results as does oil to the operation of the ponderous locomotive.

*Paper read at the June Convention of the Association of Railway Telegraph Superintendents at Detroit, Mich.

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The increasing tendency to utilize every possible time and labor saving device is aptly illustrated in the extraordinary development and expansion of the telephone service now taking place. This growth is due to a number of causes—the general prosperity existing in all portions of the country, to competition and perhaps more than we have supposed to the campaign of education which every local telephone has inaugurated and carried on in the solicitation of business, the installation of private branch exchanges and the originating of new features.

We have been fifty or more years acquiring knowledge and experience in the application of the telegraph to our personal and business necessities, until we have naturally become wedded to its use. Its availability in cases of haste or great emergency is substantially bred in us and a great portion of the people continue to rely upon its service as cheaper and equally as quick and reliable as the telephone. The tallow dip, by force of habit, still remains a satisfactory illuminant in many of the best communities in Europe, and in this country it has a large constituency notwithstanding better and practically as cheap illuminants are available everywhere. It takes time to eradicate these inclinations to continue in the old way. To close observers the telephone is having various effects on social and business life that were not at first suspected or anticipated, but the continuing developments of this character are of a surprising nature. For example, few habits are more ingrained in the commercial and business man than that of meeting on 'change. The practice long antedated railroads and has been common among all civilized peoples. But now it would appear that having learned to make extensive use of the telephone while at the exchange, brokers are neglecting business on the floor, and are transacting it more and more directly from office to office by the telephone. This practice is gaining ground to such an extent that the exchanges in some lines of trade suffer quite appreciably. So much for trade in the bulk. The cotton growers are benefiting by the high prices this year to an unusual extent because of the greater telephonic facilities they are enjoying. This simply confirms the recent statement as to some transactions in the broom corn district of Illinois. Buyers from outside began to clean up the broom corn at $60 a ton, when a telephone official called up the farmers on this system and told them the market was rising rapidly. The result was that before the season ended they had sold their crop at $240 a ton. Telephones would be cheap at any price anywhere on such terms, and it is a fact that the value and benefit of the service are not yet by any means appreciated.

The telephone develops a new field and performs a new mission. It does not necessarily interfere with the telegraph, only in so far as the telegraph falls behind in the race for superiority by failing to develop the new uses to which it might be put. As the situation appeals to me, the telegraph is fast relegating itself to the simple transmission of news, and positive and negative or confirmatory information, too important to be trusted to the slow-going mail service and not sufficiently important to justify the employment of the telephone.

The railroad and the telegraph are frequently spoken of as annihilating space, but in comparison with the telephone this is more of a theory than fact. No business or personal transaction accomplished by the aid or employment of railroad or telegraphic facilities is consummated without a perceptible lapse of time, whereas in the employment of the telephone, transactions are and must be necessarily instantaneous.

A telephone communication is more or less a personal or private one and does not involve a third person, and has advantages over any method of transmission; distance, time, business considerations and personal discomforts of travel are all eliminated.

The mail is becoming less a factor in important business transactions, except in a confirmatory degree, or when great distances intervene. Being a Government function, it can hardly be expected to be progressive. Its recent advance, the inauguration of free rural delivery, has already been anticipated by the establishment on the part of some telephone companies of what is termed the group or colony system of telephony—weaving these ruralists together with a system of cheap telephony whereby neighborly gossip may be exchanged and all the world brought in touch, relegating the once a day rural free delivery to second place, and to the delivery of publications and second-class matter. Each system, however, makes business for the other and binds us all in one common brotherhood—the brotherhood of man. So long as the transportation of the mail remains a governmental function, its progress will be slow and its operations inferior, in comparison with similar operations conducted by corporations. There has never been a time, so long as I can remember, that the Government appropriated sufficient funds for the proper transaction of the business of the New York Post Office—an office that produces revenue equivalent to that of the entire system of the country, and only lately it was stated in the public press that large mercantile concerns in New York City were carting their mail to Brooklyn, to facilitate or expedite its delivery in Manhattan Borough and elsewhere. Imagine this condition of things under corporate management! When you reflect and consider the universal ramifications, the everyday transactions by telephone and telegraph and the possibilities of the apparatus employed, how absurd it appears that a letter containing fifty or one hundred words from New York to Chicago must be handled by a number of people, sorted, pigeon-holed, bagged and distributed, hauled in wagons and carried in bulk by trains, occupying over twenty-four hours in time and finally, after further delay, delivered by carrier as rapidly as a man can walk, and in such time as permitted by the other deliveries the carrier's route makes necessary.

The telephone makes the whole world akin. Assuming that a telephone represents three persons, which I think you will consider a fair assumption, inasmuch as your neighbor is as willing to borrow its advantages as he is a newspaper, you have at your elbow an instantaneous facility for reaching in the neighborhood of a million and a half of people, and likewise they can reach you. A telephone system, therefore, to be of any great value, must be universal in its ramifications, like the post office. When you mail a letter, you give no thought as to whether there is a post office in the far-off community to which it is destined. You write your telegram with similar confidence. By reason of a uniformity in the gauge of all railroads, and a combination of interests, you make long journeys in Pullman cars, without the necessity of burdening your mind with changes. If your post office, telegraph and Pullman facilities were restricted to local limitations, their utility and convenience would be seriously impaired.

If, therefore, these great systems with vast ramifications are essential to the welfare of the people, the telephone has a claim for universality that seems to equal if not exceed them all.

In telephoning you must reach the individual, and that this may be accomplished with the same freedom from local restrictions or boundaries as the post office, it is apparent that the system must be uniform or, like the railroad, standard gauge. If the party sought for at Chicago is a subscriber to a competing system, local to that city, he is as much without the pale of interstate or interurban intercourse as though he were beyond the sea-coast line.

While, as we all know, the telephone is daily made use of in the consummation of enormous and peculiar transactions, and many interesting feats accomplished, I will, with your indulgence, refer to a transaction as illustrative of the possibilities of the telephone, that occurred a few years since, and about which considerable was said and written at the time,

The electric light plant at Newark, N. J., in 1897, was one of the largest, at that time, in operation. Its circuits extended to all surrounding cities and towns and its 2,000 or more arc and 14,000 incandescent lights provided illumination for a vast aggregation of people. Fire was discovered in the central station at 5 o'clock on the afternoon of Tuesday, December 29, and in an hour both buildings, containing a mass of machinery and dynamos, were completely destroyed and this great lighting service suspended apparently for an indefinite period. The resources necessary to immediately rehabilitate this plant were at command, but how few of us would have had the foresightedness to bring into play the advantages and ramifications of a great telephone system in the manner availed of by President Jackson of the Newark Company. Sitting down before the telephone while the buildings were still in flames and everything sure of final destruction, he rang up the central office, and was put in immediate communication with the General Electric Company's shops, Cleveland, Ohio—585 miles away. The shops were closed and the men gone for the night and only the watchman around. A call was then made for the Cleveland residence of the general manager, Mr. Hamill. Mr. Hamill was found to be in Boston. Immediately the assistant general manager was called at his residence in East Cleveland. He replied that he would telephone to Mr. Hamill at his hotel in Boston, 681 miles away, for instructions. The connection was obtained, and Mr. Hamill, in reply, gave instructions to blow the whistle, get out the men, secure cars from the railroad and have them switched into the shops and to load every available piece of electrical apparatus, and also to make arrangements, by telephone, with the Pennsylvania Railroad for a special train to run through direct from Cleveland to Newark. By midnight, before the fire had ceased in its progress of destruction, one-half the number of dynamos, weighing from 8,000 to 10,000 pounds each, were loaded on flat cars, and at three o'clock Wednesday afternoon, twenty-two hours after the breaking out of the fire, 158,000 pounds of apparatus loaded in seven cars, started for Newark. As soon as this out-

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fit was arranged for, a call was similarly put in for the Stanley Company, Pittsfield, Mass., and four more cars started in a jiffy, the same day by the way. The special from Cleveland pulled in under the unloading crane in the Newark station, Thursday noon at 12:05, 19 hours and 55 minutes from Cleveland. The fast express time is about 19 hours and the average freight time is four or five days. Right behind the Cleveland train came the cars from Pittsfield.

Other arrangements and other extraordinary demands were made and filled in a similar manner. Suffice it to say that 48 hours after the fire began, two Cleveland machines were sending out the current to illuminate the broad and beautiful streets of Newark. On Friday, four more were coupled up, followed by the Stanley apparatus from Pittsfield, which in the meantime had been put in place, so that on Saturday and Sunday nights the entire original output with its attendant machinery, belts, etc., were provided for and in operation.

It was the universality of the system that led to the accomplishment of these results. No question arose in President Jackson's mind as to the telephone system employed by these great manufacturing institutions. His mind was as broad as his comprehension, and it is perfectly safe to assume that if he were asked the value of a local telephone system he would maintain that the universality of the telephone was just as essential to every day necessities of the nineteenth century as the post office or any system I have previously alluded to.

A telephone, to be of value, must talk anywhere and everywhere. Others may prefer to transact important business with you by long distance telephone, even though you are too narrow minded to appreciate the advantages that a universal system offers, in comparison with a purely local one. The system is and must necessarily be a monopoly—a natural monopoly. All this is preliminary to the question of the policy of the railroads in the treatment of the telephone question.

Railroads go into extravagance in the luxuriousness of their appointments and accommodations for people in transit in the fitting and equipping of ticket offices located in the most expensive and extravagant quarters. Ample ingress and egress is provided by at least one large door, and oftentimes by several. These doors will accommodate a considerable number of people, in any event, in excess of absolute requirements. The telephone necessities are held to be of secondary consideration and the request for more than one would heap live coals on the head of the official suggesting such a radical measure. Yet in my city there are 6,000 telephones representing a clientage of the very best element, conservatively estimated at 18,000; to transact any business with one of these offices, these people must attempt to pass through a telephone door capable of admitting 4,500 people per annum. The facts are that one railroad attempts to force 18,000 people through this telephone door, 10,000 of whom never get through, but fall by the wayside. The struggle is not unlike that of the stage coach in Bellamy's "Looking Backward." Other railroads, more considerate of this clientage, provide private branch exchanges with ample ingress and egress, and while the calls previously referred to are lost, so far as the original destination is concerned, they naturally drift into the open door of their competitors. This lost call feature, were it possible to communicate all the facts, would prove an instructive lesson to telephone users, whatever the character of their business.

The man who travels for business or pleasure is admittedly in reasonably comfortable circumstances. His office and factory are liberally provided with telephone facilities. He realizes their importance through his everyday relations and associations with his patrons and he does not see his way clear to sacrifice his business interests for a consideration of $50 or $100 per annum, and at the same time employ an office boy who is never around when wanted, an $260.00 per annum. His residence is similarly provided, because he has learned it is necessary to his own convenience and comfort. To his mind, however, the telephone charges are exorbitant; that goes without saying.

Is it reasonable to suppose, in view of this situation, that a person with these conveniences for which he pays his hard-earned money is going to rest content with the continual "busy" report from your railroad exchange circuit? Is it reasonable to assume that this large clientage of well-to-do people is going to seek your office in inclement weather, at inconvenient times, hunting information, purchasing tickets, arranging for berths, looking up freight shipments and the thousand and one other matters of everyday occurrence?

As a general proposition, you utterly ignore the fact that the telephone represents a vast aggregation of the best paying community, or that eventually, if it is not the case very largely already, more people will transact business by telephone than through the doors of your office. This class of people is the last in the world to come down to the level of your parsimony. Better devote less effort to the establishment and elaboration of ticket offices and more to the telephone door. Seek to cultivate the acquaintance of the vast number of telephone users; be prompt in response to their calls, and as courteous and obliging by telephone as you would under any other circumstances. Consider carefully that the telephone is quietly working a revolution in business methods, that the same necessity for exchanges and public offices wherein men may congregate, bargain and trade does not exist as formerly. As the working day decreases in hours, the holidays in number and the half holidays in observance, so correspondingly, and for a similar reason will transactions by telephone increase and multiply, and this augmentation of telephone usage follows similarly the introduction of new relay switchboards, private branch exchanges and hotel telephone systems. These sub-exchange systems reach every official and scores of departmental clerks of extensive railway and industrial corporations, and every occupant of a room in a hotel is put in touch with all parts of the country. The group or colony system previously referred to will bring into the fold the largest interest of all, agriculture, and by the utilization of this system the farmer will negotiate the sale of his products and their shipments. It is this feature that will necessitate a telephone in every country railway station, and if you care to cultivate this trade, it behooves you to consider the growth of this system which is soon to reach enormous proportions.

It is frequently asserted and generally believed that the telephone is ill-adapted as a substitute for Morse in the manipulation of railway traffic. As an old telegrapher I had strongly held to this opinion, but with the knowledge of what has been done and a more thorough consideration of the subject, I am a firm believer in the superiority of the telephone. Railway people are too apt to judge the possibilities of the telephone by the crude systems they install and operate, rather than by the standard of the system familiar to the telephone expert. As one of the superintendents frankly stated in his remarks before this association at a previous meeting, referring to certain experiments with regard to simultaneous telegraphy and telephony which he had been making in a desire to furnish satisfactory telephone service to his company, "I don't suppose inductive noises to them (railway employes) was any objection. I know our people would not for a moment tolerate any such noise as that on a telephone circuit, because they were accustomed to the long distance service and you know what that is."

Assuming that a railroad is equipped with a standard system, it is pretty safe to say that there is no part of the service but what can be handled more economically, more rapidly and with greater safety by telephone. A large percentage, if not the entire transmission of service, would be performed by the practical railway operatives, men more familiar and more experienced in the operation of a railway than telegraph operators, many of whom are mere boys, preferably employed because of the small compensation the position justifies. In the use of the telephone, every operative becomes to all intents and purposes a qualified operator, the switchman equally with the track foreman.

If you install a system in the manner that obtains on the New York, New Haven & Hartford road, your regard and opinion for the Morse system will dispel itself like the morning dew. The rapid introduction by railway companies of private branch exchanges is bringing you nearer and nearer to the very scheme of railway operation just alluded to. As these exchanges are established at one point and another, the demand becomes more forcible to hitch them up tandem from one end of the line to the other and the first thing you realize you are operating your system by telephone and it becomes an indispensable feature. At the same time you are woven into the great intercommunicating system and are like the states of the Union, "One and inseparable." The obstacle to the installation and expansion of this service is primarily its cost, but in considering this cost you should concede there is a factor of expense in the maintenance of wires and stations, established by long experience, below which telephone organizations in the business to stay cannot go. A railway company knows to a mill what it costs to haul a ton of freight a mile, and below that figure the management draws the line. It costs more to ride than to walk, more to telephone than to telegraph, more to telegraph than to write, but weigh the difference. If your general manager sitting in his sanctum sanctorum had the peculiar and exclusive ability of making every official or employe subject to his control, hear his voice and command without the interposition of third parties and without the detail of correspondence and red tape, what would his services command in the railway market? The private branch exchange and its connecting links provide him with this qualification and is it not reasonable to assert that the employment of these acquired talents moves the wheels of commerce with infinitely greater

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rapidity, less friction and with wonderful economy of time? There is no red tape involved in telephone transmission; greater privacy and secrecy is assured, but above all, elasticity of operation is the predominating advantage in the railway service.

Ian Maclaren, in expressing himself regarding America, exploits a line of reasoning worthy of your sober consideration: "No one, unless he leaves the country, or becomes a crank, can escape from this despotism of activity; he is a part of the regiment and must march with his fellows. No man goes slow if he has the chance of going fast, no man stops to talk if he can talk walking, no man goes in a trolley car if he can get a convenient steam car, and by and by no one will go in a steam car if he can be shot through a pneumatic tube. No one writes with his own hand if he can dictate to a stenographer, no one dictates if he can telegraph, no one telegraphs if he can telephone, and by and by, when the spirit of American invention has brought wireless telegraphy into thorough condition, a man will simply sit with his mouth at one hole and his ear at another and do business with the ends of the earth in a few seconds, which the same machine will copy and preserve in letter books. It is the American's regret that at present he can do nothing with his feet while he is listening at the telephone."

DESTRUCTOR AND ELECTRIC POWER STATION AT ST. HELENS, ENGLAND.*

BY J. S. HIGHFIELD.

In view of the great interest at present taken in the combination of destructor and electric supply works, with the object of utilizing any available heat that may be obtained from the former, a short account of these works and the results attained may be of assistance to other local authorities.

The electric power station has been erected and equipped by the Electric Supply and Tramways Committee, who supply energy to work the local tramways, and also give a general supply to private consumers for light and power. The plant consists of four engines with direct coupled generators of a total capacity of 600 kw. A fifth engine is on order with a capacity of 300 kw. The engines are of Willans & Robinson's three-crank compound type, and work condensing. The condensing plant consists of a Wheeler condenser, capable of dealing with 20,000 lbs. of steam per hour; this condenser works in conjunction with a Klein cooling tower, and the plant suffices to maintain a vacuum of 25 to 26 inches. Adjacent to the electric works the health committee erected a destructor plant, the borough engineer, Mr. G. J. C. Broom, being responsible for the design of the works. The destructor works are under the supervision of the electrical engineer and his staff, who are accountable for the proper burning of the refuse. The weighing of the refuse and the removal of the clinker are in the hands of the borough engineer. The health committee pay for this supervision, and are paid in return for the number of units generated by the steam that is supplied by the destructors.

In this way the health committee are entirely responsible for the destructor works, and own the whole of the boiler plant, feed pumps, and steam pipes up to the main range in the engine house.

The destructor plant consists of two furnaces, each having two cells on the Beaman & Deas principle; the hot gases from each furnace pass through a combustion chamber, and then through a Babcock boiler having 1,740 square feet of heating surface. After leaving the boilers the gases pass through a Green's economizer having 96 tubes. A superheater is fitted to each boiler, which serves to give about 100° F. of superheat to the steam. The furnaces are fitted with closed ashpits, and forced draught is supplied under the hearths by a centrifugal blower, driven by an electric motor. This blower is designed to blow three furnaces, and hence works inefficiently when used to blow only two furnaces; at present only one furnace is used to supply steam to the electricity works. A test was carried out on one furnace by the electrical engineer, to determine the weight of refuse that could be destroyed, and other data which are given below:

TEST OF NO. 1 FURNACE AND BOILER OF BEAMAN AND DEAS CONSTRUCTOR.

Date of test, April 10, 1900.

Duration of test (10:30 A.M. to 5:50 P.M.), 7 hours 20 minutes.

State of weather, fine, windy.

Nature of fuel, unscreened ash-bin refuse of average quality.

Total weight of refuse burned, 16 tons 18 cwts. (37,912 lbs.)

Weight burnt per hour, 5,169 lbs.

Weight burnt per square foot of grate area, 103 lbs.

Total weight of clinker and ash, 5 tons 6 cwts. 1 qr. (11,900 lbs.)

Percentage of clinker and ash to refuse, 31.36 per cent.

Total water evaporated, 48,216 lbs.

Water evaporated per hour, 6,575 lbs.

Water evaporated per hour from and at 212° F., 7,955 lbs.

Water evaporated per pound of refuse 1.27 lbs.

Water evaporated per pound of refuse from and at 212° F., 1.54 lbs.

Temperature of water in tanks, 46° F.

Temperature of water from economizer, 190° F.

Average steam pressure, 132 lbs.

Average air pressure under grates, 3.1 inches of water.

Temperature in combustion chamber by copper test, 2,000° F.

Temperature in main flue before economizer, 537° F.

Temperature in main flue after economizer, 358° F.

Percentage of CO_2 (average of 21 readings), 10.4 per cent.

Percentage of O (average of 20 readings), 9.16 per cent.

Men employed on furnace, two firemen and one laborer to feed the refuse into the cells.

The very high results attained could not be kept up in practice, the labor being altogether too heavy, and the depreciation of the furnace would be very great at such a high rate of combustion as 103 lbs. per hour per square foot of grate area.

The working results from day to day are a better criterion of the utility of the destructor than the special figures attained during the short test quoted above.

The first shift of men, three in number, come in at 5 A.M., and have steam raised by 6 A.M. when the first engine is started; this engine charges a storage battery until 8 A.M. and is then shut down. At 7 A.M. a second engine is started to supply energy to the tramways; the engine is of 300 i.h.p., and is direct coupled to a shunt wound generator of 200 kw. The plant is run non-condensing except when the load is abnormally heavy, in order to take all the steam generated. As many as 20 cars can be operated continuously when the plant is working condensing. The boiler also supplies steam to a mortar mill which works 14 hours a day, and also to a winch which is used occasionally. The quality of the mortar made from the clinker is excellent. The destructor plant is worked from 2 P.M. on Monday till midnight on Saturday. No burning is done on Sunday, and on Monday the flues are thoroughly cleaned. For supplying the extra steam required when the lighting load comes on, one or more of the Lancashire boilers at the electric works is utilized according to the time of the year, and this boiler or boilers also takes the load on Sunday and Monday, to the time of starting work at the destructors. The destructor plant has now been working since January, and the results shown in the attached table are maintained steadily week by week. No coal whatever is used in the destructor furnaces. The total quantity of refuse at present available is about 200 tons per week, and a second furnace is worked one shift a day in order to burn this amount. It is probable that a third furnace will be erected, and the two boilers instead of one boiler, as at present, will be kept under steam; proportionate results will certainly be obtained.

RESULTS ATTAINED IN ORDINARY WORKING DURING MAY, 1900.

Average weight of refuse burnt per week, 143 tons 18 cwt.

Average weight of clinker and ash per week, 40 tons 8 cwt.

Average weight of mortar made per week, 15 tons 2 cwt.

Average weight of refuse per shift of 9 hours 13 tons 1¼ cwt.

Average units used to work fan, per ton, 9.

Average units generated from steam, per week, 7,062.

Average units generated per ton burnt, 50.

Average wages per ton burnt, 1s. 1¼ d.

* From the "Electrical Review," London.

THE PROTECTION OF TELEGRAPH AND TELEPHONE WIRES IN CONNECTION WITH OVERHEAD TRACTION.*

BY R. C. QUIN,
Borough Electrical and Tramway Engineer, Blackpool, Eng.

This question at the present time is of special importance in view of the number of traction systems now being installed throughout the kingdom, and in view also of the fact that there is such a divergence of opinion and practice. This latter is most marked in connection with the two Government departments concerned, the Board of Trade and the Post Office.

That overhead telegraph and telephone wires need protection will be admitted, but how shall this protection be best given? To the author the best method appears, and he thinks his readers will agree with him, to be the placing of these telegraph and telephone wires underground where they cross the line of tramway route. He believes the telephone company is not averse to this course being adopted; but we are met with the absolute refusal of the Post Office to consider any such proposition. Under these circumstances we must recognize the existence of crossing overhead wires.

* Paper read before the Municipal Electrical Association.

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The most usual practice until a comparatively recent date was to place guard wires above the overhead trolley line at a distance of about 18 inches, these wires being of galvanized steel and supported by insulators. There is a question which the author has often asked, and to which he has not as yet received a satisfactory reply, and therefore he takes the liberty of placing the question before his readers. It is this—"What are the insulators intended for?" Are they to protect the telegraph or telephone wires or the trolley line?

Assuming that we adopt guard wires, they should be supported on poles two feet above the trolley line, but they should not be insulated. If a telegraph or telephone wire break what need is there to insulate from earth? If two guard wires in the same horizontal plane and 18 inches apart be placed over the trolley line, the probability is that the broken telegraph or telephone wire would not come in contact with the trolley line or passing trolley; but it might do so. In that event it is better that the guard wire should be efficiently connected to earth, as a short circuit would be the result, and if both lines, telegraph and telephone, and trolley line be properly protected by maximum current apparatus no damage would ensue. The author would, however, point out that it is not sufficient to have these guard wires clamped to a traction post, when the traction post is bedded in concrete. There should in all cases of guard wires be two poles bonded to the rails, and these poles should preferably be the end ones of the guard wire section. The telephone and telegraph wires should be provided with fusible cut-outs or other similar device for the protection of the terminal instruments, and this is a matter of no great cost. With these precautions there need be no fear of electrical accidents from overhead telegraph and telephone wires.

There is another system of protection now largely adopted and which consists of fastening to the trolley line brass clips, and placing vertically over the trolley line a wooden moulding of greater width than the trolley wire. This system, to the author, appears to have several objections. It is more unsightly than the guard wires, and brings the trolley line into greater prominence. There also appears to be difficulty in thoroughly securing these strips, for in most towns in which they are in use many lengths have become detached. Further they do not afford the same protection as guard wires. A telephone wire may break and fall on the strip, but so far no great damage results. A car however comes along, and as has happened the driver does not notice the fallen wire, but the cheeks of his trolley wheel touch the wire forming contact between it and the trolley line. We then have a live telephone wire earthed only through its terminal instruments, and a live dangling wire on the car, which is not assuring to the passengers.

There is a third method which is advocated by the Post Office, and that is a system of bunching telegraph wires so as to reduce the number of crossing places, and then forming an insulated cradle or hammock round these wires. The principal objection to this course would be extreme unsightliness. It moreover by no means follows that if a wire breaks it will not fall through the cradle, as the meshes are 2 to 3 feet square.

If we are to regard as impossible the laying underground at crossing places of telegraph and telephone wires, then the author suggests the following as the best method to protect telegraph and telephone wires:

First—The erection of two guard wires 18 inches apart, at a minimum height of 2 feet above the trolley line.

Second—The length of the guard wires to be such that should the crossing telegraph or telephone wire break close up to one span insulator, and be blown horizontally in either direction it could not when falling come in contact with an unguarded portion of the line.

Third—Each span of guard wires should be separate and distinct from its neighbor, but metallicly looped across.

Fourth—No insulators whatever should be used, but guard wire standards be bolted direct to the bracket arms, or to the span wire as the case may be.

Fifth—The terminal posts of each length of guard wire should be bonded to the tram rails.

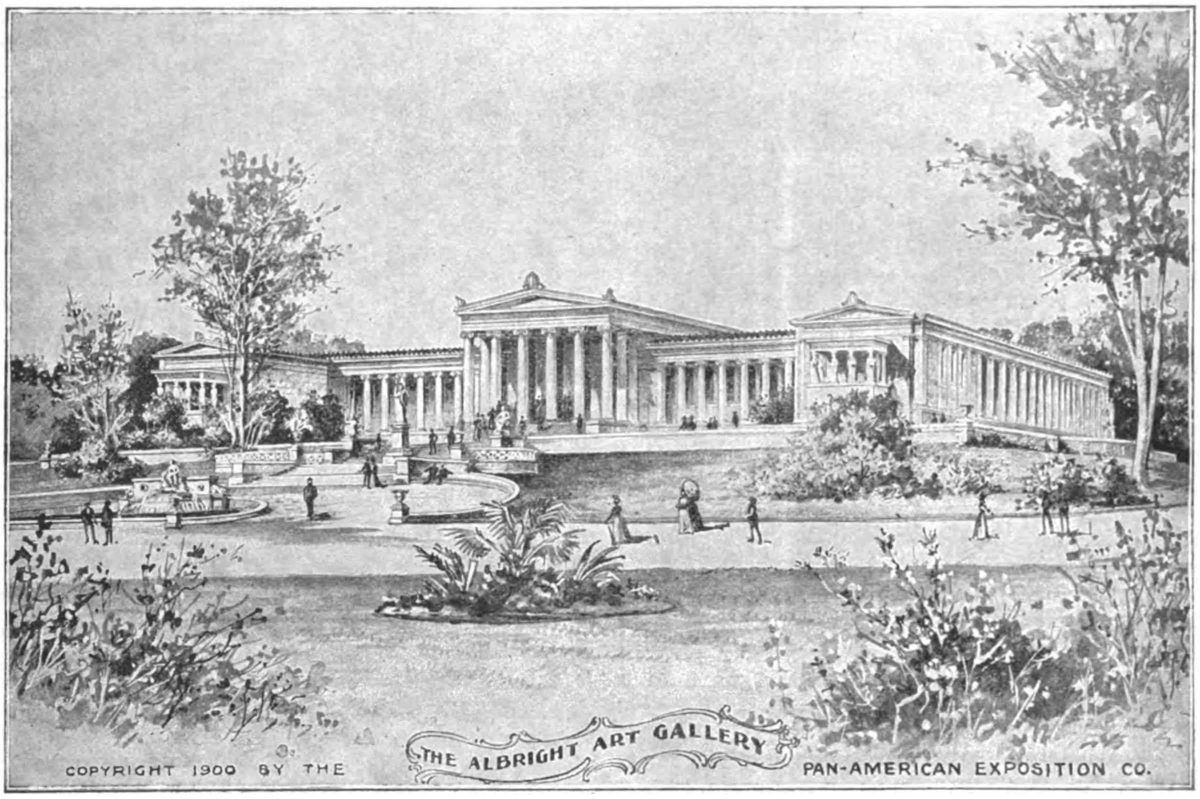
Sixth—The trolley line should be divided into sections, and each protected by a maximum current device. These sections should preferably not be of equal length, but proportioned for equal maximum working current.

Seventh—The crossing span of telegraph or telephone wires should be terminated by a disconnecting insulating shackle on each side and the connection across these shackles should be by fusible metal bridge.

If these suggestions be carried out, the author considers that all that is humanly possible to protect overhead telegraph and telephone wires will have been done.

BUFFALO'S ART PALACE.

The city of Buffalo is soon to have one of the most beautiful buildings in the western world, a public art gallery to cost upwards of $350,000.



THE ALBRIGHT ART GALLERY

The building is the gift of J. J. Albright, a citizen of Buffalo and a liberal patron of art, who desires to bestow upon his city a structure that will forever yield immeasurable pleasure to those who visit it, and become, as well, a center of culture and art. The only conditions imposed by the public spirited donor were that the city of Buffalo should furnish a site, and that the Fine Arts Academy of Buffalo, which is made the custodian of the property, should raise a maintenance fund of $100,000. The city promptly deeded the site requested, which is just within the limits of Delaware Park, overlooking the beautiful park lake. The Fine Arts Academy has complied with the terms of the gift as they applied to the maintenance fund, and the building will be hurried to completion as rapidly as conditions will permit. The building will be used as the art palace of the Pan-American Exposition and thereafter become the permanent home of Buffalo's art collections.

This magnificent edifice will be 250 feet

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long by 150 feet wide, the principal facade looking toward the east. The building will stand upon a broad terrace 35 feet above the level of the park lake, which lies but a few rods below and to the eastward. The principal approach will be by a beautiful monumental flight of steps, the contour of the ground giving opportunity for stately embellishment. The terrace walls are to be of heavy granite blocks. Statuary, fountains, formal floral displays and lawns will complete the ornamentation of the terrace.

The style of architecture chosen is the classic Greek, both the eastern and western facades showing rows of rich, graceful columns. The style is Ionic. A semi-circular colonnade forms the central figure of the west or Elmwood avenue front. The building has broad wings at the extreme northern and southern ends, terminated by porches which will be reproductions of famous architectural works of ancient Greece. The highest peak is only 45 feet above ground. The Erechtheum of Athens has been a prolific source of inspiration for the architects, Messrs. Green & Wicks of Buffalo. The portico of the Erechtheum, famous for its caryatides, will be one of the works to be thus reproduced. The Erechtheum was an ancient temple and is one of the most interesting of the ruins of the Acropolis at Athens. It was rebuilt after the Persian invasion, about 400 B. C.

Entering the building by way of the main approach one comes first to the hall of statuary, in the middle of the building, which is 71 x 100 feet. Directly west of this is the hemicycle, a large semi-circular room with tiers of seats and a rostrum, where lectures may be given before audiences of several hundred people. North of statuary hall will be a gallery 35 x 58 feet. On either side of the corridor leading to this gallery are library and board rooms. Beyond, in the extreme north wing will be seven studio rooms, connected by a long corridor. In the western part of the building are two ante rooms and four large galleries. In the large light basement will be numerous other rooms for all sorts of uses in connection with the proper management of the building, such as bicycle and cloak rooms, lavatories, janitor's quarters, electric lighting and heating, packing and storage. The building will be strictly fire-proof, the materials being white marble, steel beams, brick, cement and stone. The structure will require 25,000 cubic feet of marble. All materials will be of the best, so that an enduring edifice may remain when present generations shall have vanished.

Sweden Interested in Electrical Mining Machinery.

Colorado miners are to be called upon to give instruction in mine operation to a people who have been engaged in mining for probably a thousand years. The mining machinery that has attained its present perfection while employed in Colorado mines will be installed in Swedish mines, where in some instances the methods of work now in use does not differ greatly from that of centuries ago.

K. G. Brunnberg, a mining engineer of Grangesberg, Sweden, is in Colorado studying the methods of mining and particularly making a study of electrical mining machinery.

Besides his interest in electricity as a power in mines, Mr. Brunnberg is interested in American mining machinery, and has already concluded to make a trial of it in the iron mines. He will ship machinery from this country to work with that already in use, for the sake of comparison by results, and if the American machinery proves satisfactory, Sweden will become a new market for American built machinery.

Mr. Brunnberg is connected with one of the largest mining companies in Sweden. The property is situated in the central part of the country, at Grangesberg, but they are now reaching out into a new field that he says will be larger than the old. From the mines now in operation there is taken an average of 1,000,000 tons of ore annually, one-half of which is shipped to Germany for treatment. The scarcity of fuel in Sweden is given as the reason for shipping ore abroad. The iron is taken chiefly from pit mines, some of them with openings 300 feet wide, but there are also underground workings where shafts have been sunk to a depth of 1,200 feet.

"There is but little gold mined in Sweden," said Mr. Brunnberg, "but not far from the iron mines of my company are the copper and gold mines of Farlun, that have been in operation so many years that it is not known when they were first worked. There is positive historical data to prove that they have been yielding the metals for 700 years, and they were probably in operation long before.

"We have not as satisfactory machinery in our mines as that which is in use in America. After I have made a study of the Colorado methods, I shall send home a plant of machinery similar to that I have seen here."

Protection of Buildings from Lightning.

The great obscurity which has long attended the subject of the varying effects of lightning strokes on buildings has in some measure been dissipated by recent investigations of Killingworth Hedges. Lightning conductors, as usually arranged, do not guard at all against what Dr. Oliver Lodge calls the "splitting" action of the current. They may serve to discharge or pass off on to the atmosphere the induced electricity from the earth and from the buildings upon it, but as lightning protectors they are so arranged that should they actually be struck by a flash the building would probably be set on fire. There is also an off chance that a portion of the electric current may be diverted into "unearthed" metal work and play havoc with everything in the path of its tortuous course to earth. Mr. Hedges says that in the cause of the safety of the public buildings it is necessary to explode the fallacy that a properly constructed lightning rod never fails. During a thunderstorm the atmosphere and all conducting objects in the immediate neighborhood become charged with electricity at a constantly increasing potential or intensity as the distance from the earth increases. Even objects directly on the earth, such as railroad tracks, high fences, etc., become charged and will throw out sparks of greater or less brilliancy. Mr. Hedges pronounces the steps taken for the protection from lightning of many public buildings in the past to be anything but adequate. The spire of old St. Paul's Cathedral in London was partially damaged by lightning three times, and its destruction by fire in 1561 was attributed to the same cause. In 1872 new lightning conductors took the place of those originally put up at the cathedral under the advice of the Royal Society about 144 years ago. But even the new conductors were found to be lacking in many essential points. Elements of danger due to inadequate conductors, faulty connections and other imperfections were discovered. Of this dome, statues, choir and towers none was efficiently protected. The plan recommended for St. Paul's, taking into consideration the large amount of copper already disposed about the building, is first to run three cables from the metal work of the framework supporting the cross to the roof of the dome and connecting them with the eight existing conductors, reuniting them at the base of the dome to the present system, which is increased by running a new half-inch seven-ply copper cable on the top of a parapet entirely around the building. From this horizontal conductor aigrettes, consisting of pointed copper rods, are "teed" at intervals. The whole is united by running in hard solder and the system is effectively carried to earth. It is said that the system is a model one for similar ecclesiastical structures, which do not lend themselves very readily to improved methods of lightning protection.

Visit of the American Institute of Electrical Engineers to London.

We learn from the Secretary of the British Institution of Electrical Engineers that the members of the American Institute will be offered a trip up the Thames in electric launches on Sunday, August 12, the visitors and their hosts leaving by a morning train for a starting point at a convenient part of the river, and returning the same way after lunch at a water-side hotel. On the evening of Monday, the 13th, they will be entertained by the president (Prof. Perry), and members of the Institution at a dinner in London. On Monday and Tuesday special visits will be arranged to works and places of interest in the neighborhood of London: particulars of these visits will be found awaiting American guests on their arrival in England.

Members of the American Institute who will be in London at the time of the visit are requested to place themselves in communication with the Secretary of the Institution of Electrical Engineers, 28, Victoria street, London, S. W., to which address they are also invited, if they care to do so, to have their mails forwarded.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended July 21:

Antwerp, 31 boxes motors, $5,317; 49 packages, $12,388; Argentine Republic, 17 cases, $1,657; Athens, 29 packages, $797; Brazil, 59 cases, $3,705; British East Indies, 45 packages, $4,349; 6 cases, $987; British Possessions in Africa, 148 packages, $10,591; British Guiana, 1 case, $30; British West Indies, 8 packages, $349; Bristol, 169 cases, $30,535; Brussels, 5 packages, $116; Central America, 69 cases, $739; China, 5 cases, $597; Copenhagen, 2 boxes, $330; Cuba, 29 packages, $1,148; Dublin, 51 packages, $3,800; Ecuador, 91 cases, $16,370; Genoa, 3 packages, $163; Glasgow, 84 packages electric motors, $7,762; 3 cases $200; 140 reels electric cable, $49,205; Hamburg, 50 packages, $6,666; 2 packages electric motors, $85; Havre, 56 cases, $11,282; Hayti, 6 packages, $107; Hull, 3 cases, 196; Japan, 139 packages, $9,567; 94 cases, $4,764; Liverpool, 142 packages, $16,707; 9 cases; 253; 43 packages motors, $2,040; 460 trolley poles, $16,587; London, 8 packages, $693; 217 cases, $12,827; 23 packages automobiles, $24,750; 21 cases motors, $1,470; Mexico, 170 packages, $19,338; Naples, 39 cases, $9,289; 93 packages motors, $2,162; Oporto, 5 packages, $199; Plymouth, 140 trolley poles,

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$5,143; 110 cases, $302; Porto Rico, 95 packages, $2,660; 1 case, $23; Riga, 4 cases, $508; Sandwich Islands, 34 packages, $97; Santo Domingo, 2 cases, $23; Southampton, 219 packages, $4,872; St. Gall, 5 cases, $400; St. Petersburg, 43 cases electric motors, $6,992; 4 cases, $133; U. S. Colombia, 26 packages, $1,246.

LEGAL NOTES.

Judge Shipman, last Wednesday in the United States Circuit Court of New York handed down an opinion, in which he held that the Anchor Electric Company had infringed on a patent owned by the General Electric Company for improvements on incandescent electric lamps. An accounting of profits illegally derived from the infringement is ordered, and the defendant company is restrained from further infringement.

In a recent petition filed with the Circuit Court of Chicago James H. Raymond of the law firm of Raymond & Omohundro asks that a receiver be appointed for the International Electric Indicator Company, which has possession of one of the patents covering a divining rod. Attorney Raymond claims he is in danger of losing money that is due him from the company if it is allowed to transfer its patent to some other company. A temporary injunction of the Circuit Court was issued to restrain the transfer.

On July 18 Judge Shipman of the United States Circuit Court of New York handed down a decree in favor of the Thomson-Houston Electric Company on its claim to ownership of the Walter H. Knight patent for improvements in electric motor regulators as against the claim set up by the Lorain Steel Company. A perpetual injunction restraining the Lorain Steel Company from using the patents was granted and damages were allowed, the amount to be determined by John A. Shields as master.

Roentgen Society of the United States.

The Roentgen Society of the United States, will meet in New York City December 13 and 14, 1900, at the Academy of Medicine. Papers have been promised by eminent men abroad and here, and a very successful scientific meeting is assured. There will be offered advantages to the visiting members for instruction in X-ray work that cannot be had under any other conditions. It is especially desired that all hospitals using X-ray apparatus, X-ray studios, physicians, surgeons and dentists doing X-ray work, scientific investigators, manufacturers and dealers in X-ray apparatus of all kinds throughout the United States should at once send their names and addresses to the Chairman of Committee of Arrangements, Dr. S. H. Monell, 43 East 42d street, New York City, so that they be sent important notices regarding the meeting.

This society is the only one of its kind in America, national in character and for scientific purposes only.

All those wishing to become members or read a paper before the society may communicate with the secretary, J. Rudis Jicinsky, M. D., Cedar Rapids, Iowa.

Coal at One End, Power at the Other—the Lubricant in Between.

Plain and practical remarks upon lubrication are always of interest and value to the extensive user of machinery, and ought to be of proportionate value to all users of machinery. We quote from a paper read at a railroad club, and incidentally sprinkle in some graphite as we go along.

All men are wrong about something. A few men have found out that the coal they burn at one end of their plant, and the power they get at the other depends on the oil they use between; the rest treat oil as a trifle. A few men have also found out that the addition of 10 to 15 per cent. of Dixon's Pure Flake Graphite to the oil or grease used will enable the oil or grease to do several times more work. Other men are finding this out more slowly. A few don't care a continental.

A good lubricant is a trifle as to its cost, but it is not a trifle as to consequences. Consider what a lubricant is for—to save power in machinery. If the cost of a lubricant were one hundred times more, we would use it, but we would also study it. Even then the true question would be, not what lubricant costs least, but what lubricant saves most of power and machinery? The magnitude of lost power in machinery is variable; it is always large. It may, probably, be fairly estimated that one-half the power expended in the average case, whether in mill or shop, is wasted in lost work, being consumed in overcoming the friction of surfaces. The real value of a lubricant to the user depends upon the value of power saved by its use. To a man running a one-horse thresher it may matter but little whether the bearings of the old machine are lubricated or not, although there might be an increase in the day's output and a less tired nag if they were. To the larger user of power poor and inefficient lubrication means enormous waste of power and costs for repairs. Practical experience is far superior to theory, and while it has been most thoroughly demonstrated that an oil or grease is necessary for saving power and preventing wear, it has been just as thoroughly demonstrated that Dixon's Pure Flake Graphite is the only solid lubricant that largely enhances the lubricating value of oils and greases. Furthermore, where this graphite is used a cheaper or lower grade of oil or grease can be used and the expense of lubrication reduced as well as power saved.

JOSEPH DIXON CRUCIBLE CO.,
Jersey City, N. J.

PERSONAL MENTION.

Mr. Harry R. Bostwick, a civil engineer of San Francisco, Cal., has lately closed a contract with the Government of Corea to build an imperial highway fifteen miles long and an extension of the Corean Electric Railway on one side of it.

Mr. Alvin H. Dewey was recently appointed manager of the Bell Telephone Company in Rochester, N. Y.

INCORPORATIONS.

The Electrical Lighting Company, Caro, Mich.—to furnish light and power for Caro. W. J. Gamble is interested.

The Lincoln Gas & Electric Company, Lincoln, Neb—to operate gas and electric plants. Capital stock, $1,500,000. Incorporators: H. F. Rose, J. C. Vanpiper, S. H. Burnham and I. M. Hammond, all of Lincoln.

The American Universal Underground Electric Railway Company, Camden, N. J.—to operate trolley systems. Capital stock, $200,000. Incorporators: W. Bartram, J. M. Deal, W. C. Alexander and C. P. Ballinger.

The Irondale Water, Light & Power Company, Irondale, Ala.—to maintain and operate a system of water and gas works and an electric light and power plant. Capital stock, $100,000. Incorporators: F. W. Turpin, N. H. Sewall and Robert R. Zell.

The Citizens' Electric Light & Power Company, Kenton, O.—to produce and supply electric light. Capital stock, $20,000. Incorporators: John Glenn, W. A. Ross, Theo. Miller, Jacob Ferbing and W. L. Sinly.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N W, Washington, D. C., who has been identified with this work before the U. S Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W, Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED JULY 17, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

653,649. Underground System of Electric Railways. Charles A. Balph, Pittsburg, Pa. Filed Sept. 14, 1897.

653,885. Casing for Electric Car-Lighting Apparatus. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed April 4, 1900.

653,930. Fender for Tramway or Like Vehicles. Johann von Holt, Hamburg, Germany. Filed Oct. 30, 1899.

653,970. Electric-Railroad Track. Ekko Sollmann, Hoboken, N. J., assignor to the George Borgfeldt & Company, New York City. Filed April 24, 1900.

653,982. Electric Headlight. James W. G. Becker, Kansas City, Mo., assignor to the United States Headlight Company, Buffalo, N. Y. Filed April 23, 1900.

654,050. Trolley-Pole. Charles A. Brown, Lorain, O., assignor of one-half to Albert V. Hageman, same place. Filed Aug. 22, 1899.

654,105. Electric-Railway Appliance. Daniel E. Shoop, Turtle Creek, Pa., assignor of one-half to John F. Baxter, Pittsburg, Pa. Filed Dec. 9, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

653,785. Electric Arc Lamp. Sigmund Bergmann, New York City, assignor to the General Incandescent Arc Light Company of New York. Filed March 18, 1899.

653,962. Incandescent-Lamp Socket. Frederic H. Manchester and Irving E. Brown, Providence, R. I. Filed May 9, 1900.

653,984. Electric-Arc Lamp. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Nov. 7, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

653,685. Electric Cut-Out. Hiram P. Maxim, Hartford, Conn., assignor, by mesne assignments, to the Columbia & Electric Vehicle Company, Jersey City, N. J. Filed Jan. 20, 1899.

653,698. Electric Switch. James T. Robb, New York City, assignor to the Mitchell Vance Company, same place. Filed Jan. 31, 1900.

653,725. Electric Motor. Daniel C. Woodward, Hartford, Conn. Filed Sept. 6, 1898.

653,806. Electric Meter. Caryl D. Haskins, Newton, Mass., assignor to the General Electric Company of New York. Filed May 8, 1899.

653,857. Electrical Controller. Edgar H. Wise, Johnstown, Pa. Filed Jan. 19, 1900.

653,906. Alternating Current Motor. Edgar W. Brown, Dayton, O. Filed Jan. 29, 1900.

653,963. Dynamo-Electric Machine. William M. Mordey, London, Eng. Filed Oct. 25, 1898.

TELEPHONES AND TELEPHONE APPARATUS.

653,730. Telephone-Transmitter Arm. James F. Craven, Pittsburg, Pa. Filed March 22, 1900.

654,112. Telephone Call Register. William Gray, Hartford, Conn. Filed Sept. 17, 1898.

SIGNALS AND SIGNALING APPARATUS.

653,934 653,935-653,936. Page-Printing Telegraph. Donald Murray, New York City, assignor to the Postal-Telegraph Cable Company, same place. Filed Nov. 28, 1899; Feb. 7, 1900; Feb. 27, 1900.

653,941. Telegraph-Switching Apparatus. John F. Skirrow, East Orange, N. J. Filed Jan. 5, 1900.

MISCELLANEOUS.

653,667. Graphophone. Arthur C. Ferguson, New York City. Filed Oct. 9, 1899.

653,708. Hydro-Electrotherapeutic Apparatus. Johann J. Stanger, Ulm, Germany. Filed April 29, 1899.

653,713. Electric Clock. Samuel P. Thrasher, New Haven, Conn. Filed Jan. 14, 1899.

653,715. Apparatus for Electrically Treating Fabrics for Waterproofing or Other Purposes. Jean T. Van Gestel, New York City. Filed Nov. 1, 1898.

653,763-653,764-653,765. Electrogalvanic Battery. Horatio J. Brewer, New York City. Original application filed July 7, 1899. Divided and this application filed Nov. 15, 1899.

653,770. Galvanic Battery. Albrecht Heil, Frankfort-on-the Main, Germany, assignor to Columbus Electricitats-Gesellschaft mit Beschrankter Haftung, Ludwigshafen, Germany. Filed April 9, 1900.

653,784. System of Electrical Distribution. Charles De W. Anderson, Chicago, Ill. Filed April 10, 1899.

653,841. Electric Fuse. Thomas H. Brady, New Britain, Conn. Filed Jan. 2, 1900.

653,883. Secondary Battery. Arvid Reuterdahl, Providence, R. I., assignor, by direct and mesne assignments, of two-thirds to Leonard H. Campbell and George F. Weston, same place. Filed Feb. 12, 1900.

653,933. Electrode for Electrolyzing Apparatus. Rene Moritz, Lille, France. Filed Nov. 29, 1899.

653,957. Magneto-Electro Generator for Gas-Engine Igniters. Garrett W. Hendricks, Indianapolis, Ind., assignor to the Hendricks Novelty Company, same place. Filed April 30, 1900.

654,067. Electric Low-Water Alarm. Frederick Leadbeater, Detroit, Mich. Filed April 2, 1900.

654,103. Attachment for Instruments of Precision. Carl O. F. Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed May 15, 1899.

654,104. Measuring Instrument. Karl O. F. Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Sept. 2, 1899.

654,113. Battery-Electrode. Gustavos Heidel, St. Louis, Mo., assignor to the Globe Electric Company, same place. Filed Oct. 2, 1899.

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THE TELEPHONE WORLD.

Plans of the National Telephone & Telegraph Company.

Commenting on the plans of the mammoth telephone company recently incorporated, the "N. Y. Commercial" says:

"Although negotiations have not yet become tangible it can be announced on unquestionable authority that a connecting current exists between the new National Telephone & Telegraph Company, and the Western Union Telegraph Company, and that if a project, which at present is only tentative, can be carried to the point of definite deal, there will be formed a powerful consolidation of telephone and telegraph interests.

It is just beginning to dawn upon the financial community that the creation of the $50,000,000 telephone company to absorb the Telephone, Telegraph & Cable Company of America, is a move of extraordinary importance. There are not lacking signs to indicate that the capital of this new concern is only the foundation for one of the largest corporations in the world.

"If present plans are not disturbed the National Telephone & Telegraph Company will shortly be formally organized, and one surprise, which the announcement of the full board of directors is likely to cause, will be the appearance in the directorate of figures now prominently identified with Western Union interests.

"The Western Union has already admitted its intention to enter the telephone field.

"It has some $14,000,000 available for the undertaking, this money to be realized from the recently authorized bond issue. And now it comes from a carefully guarded source that the Western Union will join forces with the National Telephone & Telegraph Company if terms can be agreed upon. The Western Union has an old grievance against the American Bell Company, and an alliance in that direction is dismissed as an impossibility.

"Meanwhile the Bell Company is changing its base of operations in order to be in a better position for the impending war. The Bell Company is a Massachusetts corporation and by its charter is restrained from guaranteeing dividends on the stock of foreign corporations. To circumvent this, it organized the New York Telephone Company, which is really the long distance arm of the New York Company.

"The stock of the New York Company was recently increased to $70,000,000 in order to take in the stockholders of the Bell Company, and the Bell Company is now winding up its affairs preparatory to moving into New York under the New York Telephone Company. This will probably be accomplished within 90 days.

"Some months ago the Bell Company, in negotiating for control of the Smith-Vassar system, proposed to increase the capital stock of the Smith-Vassar Telephone Company to $10,000,000 and guarantee 6 per cent. dividends thereon, but owing to its inability to do this at once, because of the Massachusetts charter, it lost the Smith-Vassar system, which is now passing into the control of the National Telephone & Telegraph Company.

"It is announced that before the close of the year the $50,000,000 capital of the National Company, will be fully employed in the business for which it was particularly organized—namely, that of electrical communication and the manufacturing incident thereto."

The Citizens' Telephone Company of Morristown, Tenn., has about completed its system, and has begun operating its exchange. The company has over one hundred 'phones in Morristown, and a fair prospect of soon reaching the 200 mark, besides having connection with all the near-by towns, and the People's Telephone Company of Knoxville. The Citizens' Telephone Company, of which Prof. J. S. Hill is president, and W. O. Moser, of Greeneville, is manager, was organized when the East Tennessee Telephone Company purchased the Morristown's Telephone Company's system, and tried to raise the rent of the 'phones. It is said to be one of the best systems in the South. Nearly every subscriber of the East Tennessee Telephone Company in Morristown is taking 'phones from the new company and say they will quit the East Tennessee Company entirely. Not a business house which has the East Tennessee 'phone refused to take a 'phone of the new company.

The People's Mutual Telephone Company commenced on the sixth day of this month putting in its plant and system in San Francisco, Cal., under its franchise, and it intends to prosecute work as rapidly as possible, and expects to have its telephone plant and exchange in operation and completed within six months.

The Supervisors of Woodland, Cal., have accepted the bid of the Capital Telephone & Telegraph Company and have passed an ordinance authorizing the erection of poles and the stretching of wires.

As a result of a strike declared by operators in the local telephone exchange and the exposures of inadequate service incident thereto, the Seattle (Wash.) city council lately passed a resolution instructing the controller to invite correspondence with rival companies throughout the East looking toward the establishment of another system and assuring them that necessary franchises could be secured. The committee of the whole was also instructed to report to the council an ordinance declaring forfeited the franchise of the Sunset Telephone & Telegraph Company, which has over 3,000 subscribers in that city. The resolution was passed at the request of committees from merchants, manufacturers and the Chamber of Commerce, which bodies claim that the service is totally inadequate.

News from Kansas City, Mo., states that the effort to break the Bell Telephone Company's local monopoly has reached a crisis. At the last meeting of the city council the upper house passed a bill granting a franchise to the Missouri Interstate Telephone Company. This provides for improved 'phones at about half present rates, $48 a year for long distance business service, as against $96 to $108, and $36 for residence 'phones, which are now $72. Besides, the city is to have 3 per cent of the gross receipts, many free 'phones for public offices, and the privilege of municipal purchase in 12 years. The upper house passed the bill, but in the lower house it was "hung up"—sent to a committee.

The Paterson, Passaic & Suburban Telephone Company of Paterson, N. J., arranged last week to have its charter so amended as to enable the company to extend its business throughout New Jersey and into adjoining States. The company is one of the largest independent companies in New Jersey. The following directors were elected at the annual meeting: Walter Bamford, Joseph Bamford, Wayne Dumont, George Post, John K. Burke, Bernard Katz, William E. Williams, Alfred Post, J. W. Lindsay, Herbert Katz, George A. Meyers, Joseph Bamford, Jr.

At a meeting of the stockholders of the Weakley County Telephone Company, at Martin, Tenn., George E. Bowden was re-elected president; Dr. D. W. Scates, vice-president; J. H. Wilson, treasurer; Roy W. Martin, secretary, with the following directors: T. M. Ryan, T. J. Jeter, J. E. Kennedy, R. W. Martin, G. W. Hall, J. L. Smith, T. H. Farmer, C. W. Cottrell and Ted Little. The company is in a prosperous condition. There are 167 telephones in use in Martin, and about 50 have been subscribed for at Dresden.

Suit has been brought against the Chicago Telephone Company by Miss Maud Turnbull of Chicago for $20,000 damages for injuries received while on duty at the exchange, 203 Washington street. About two months ago during a storm, she received a severe electrical shock and has been paralyzed since. She is 20 years old and formerly supported her mother and a younger brother. Her condition, it is said, has not improved since the accident.

Wichita, Kan., is to have another telephone line running to Hutchinson in that State, which will connect with all of the Missouri Pacific stations between the two places. There is at present a gang of men working on the line at Haven, Kan., and the construction is being pushed as rapidly as possible. Superintendent McDaniel of Kansas City when in Wichita said: "I am well pleased with our business in Wichita, and by the first of August expect to have our new switchboard in proper condition for service."

Mr. W. T. Pittman, representing the Southeast Texas Telephone Company of Corrigan, Tex., was in Alvin recently interviewing the business men in regard to the establishment of a local telephone system for Alvin. He has decided to begin the construction of the exchange, and will start the work soon.

The Athens (Tenn.) Telephone Company is now preparing to enlarge and renovate its plant at Athens. It is placing copper wire and adding to the plant and making it more efficient in every particular. The plant is owned by Mr. Roy Smith.

The Cleveland & Cornelia Telephone Company has been organized in Cleveland, Ga. Work has been begun, and in a few weeks it will be completed.

The telephone was first practically used in England in 1876, when over 115 miles of wire existed between London and Norwich.

The Columbiana County (Ohio) Telephone Company has increased its capital stock from $200,000 to $300,000.

The Cumberland Telephone Company has opened its exchange at Clinton, La.

Application was recently made in Trenton, N. J., for a charter for the "Development Company of the Collins Wireless Telegraph and Telephone System." The capital stock has a par value of $25,000 in shares of $10 each. This company is an auxiliary corporation in the development of the system of wireless telegraphy and telephony invented by A. Frederick Collins. A patent has been applied for, and it is expected the company soon will be in a position to put the invention into practical use. Professor Collins' system differs entirely from Marconi's, and the theory on which the transmission is effected is a new one. The system has been tested in Philadelphia and proved, so it is asserted, satisfactory. If the results in the next few months should be favorable, a company of $10,000,000 capital stock will be organized and the whole enterprise put on the market.

A settlement of the strike of the Bell Telephone linemen at Rochester, N. Y., seems as far off as when the strike was begun. At a meeting recently no action of definite nature resulted, the employes and officers of the company not being able to bring about a settlement of the difficulties. The Bell Company officials are firm in their ten hour day demand, and claim that they get only eight hours of work out of the men on that basis. Their employes are demanding an eight hour day at $2.50, and allowance of time and one-half for working overtime, and double time for Sunday work.

When a test was made recently at the Bell Telephone exchange at Burlington, Pa., it was discovered that there was a break on both the Philadelphia and Trenton trunk lines. The matter was at once investigated and it was found some two miles of copper wire had been stolen from the poles a short distance from the city. The wire was taken out in sections, as it had been put in. The weight of the copper stolen was about 400 pounds.

A special meeting of the stockholders of the New York Telephone Company has been called for August 8 for the purpose of voting on a proposition to increase the capital stock from $16,000,000 to $30,000,000. At the offices of the company all information was refused, pending the meeting, as to the purpose of the proposed increase.

Several important improvements in its local and long distance systems have been recently made by the Southwestern Telegraph and Telephone Company at Dallas, Texas. Regarding these General Manager J. E. Farnsworth says: "Outside of possibly three or four of the larger cities of the United States this will be the largest and best equipped long distance office in the country. It is a better plant than there is in Chicago, Pittsburg or Cleveland. Probably only New York City itself excels us."

The New York and New Jersey Telephone Company has obtained from Justice Hooker a writ of certiorari to review the action of the State Board of Tax Commissioners in fixing the valuation of its special franchise as real property at $1,031,882. The assessment covers the company's special franchises in Kings, Queens and Richmond. The company contends that the law of 1899 is unconstitutional.

Advices from Grand Rapids, Mich., state that at the annual meeting of the directors of the Muskegon Citizen's Telephone Company a 4 per cent. semi annual dividend was declared and officers elected as follows: President, Thomas Munroe; vice-president, Thomas Hume; secretary, Joseph B. Ware; treasurer, Leigh B. Smith.

J. J. Dixon, of the Home Telephone Company, was recently in Bessemer, Ala., canvassing for the company. He is reported as saying that the local exchange will start out with about 300 'phones, and that work on the system will shortly be begun. Jonesboro, Brighton, Dolomite and Woodward, all suburbs of Bessemer, will be connected with the local exchange.

The Anderson Telephone Company, an independent concern has been organized in Indiana, with George W. Beers, of Ft Wayne, as president. The new company will have its plant ready for operation by January 1.

The Tonawanda (N.Y.) Telephone Company, a branch of the corporation which is competing with the Bell Telephone Company in the Tonawandas, is rushing its business with all the speed that is consistent with good work.

TELEPHONE INCORPORATIONS.

The Indiana Telephone Company, Hartford City, Ind.—to operate telephone lines. Capital stock, $50,000. Incorporators: W. B. Cooley, A. G. Lufton, H. D. Miller, all of Hartford City.

The American Electric Telephone Company, Jersey City, N.J. Capital stock, $3,000,000. Incorporated in Illinois with capital of $150,000.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Altona, Ill.—The electric light plant at this place was recently destroyed by fire. It was valued at $3,000 and was owned by Mr. Tomquist.

Bellaire, Mich.—J. L. Hisey of Sparta may establish an electric light plant here.

Bradford, O—The citizens of this town are discussing the advisability of erecting an electric light plant.

Bay City, Mich.—An eastern syndicate recently asked the common council for a franchise to install an electric heating, lighting and power plant here. There is said to be sufficient capital back of the company to do all it contemplates.

Beeville, Tex.—The Beeville Light Company, with a capital stock of $10,000, was lately incorporated for the establishment of an electric light and power plant. The incorporators are P. H. Swearinger, B. Dubinski and S. J. Brooks.

Cannelton, Ind.—Local architects have submitted plans for a large electric light plant here for the use of the Indiana Cotton Mills Company.

Colborne, Ont.—The electric light station with its entire plant, owned and operated by James A. Spence, was recently destroyed by fire.

Columbus, Ind.—The city council is considering the feasibility of erecting a municipal electric light plant.

Des Moines, Ia.—The Des Moines electric light plant was damaged by a recent storm.

Durant, I. T.—The electric light company of this place was one of a number of companies to suffer from the recent fire.

Giddings, Tex.—The citizens are agitating the question of building an electric light plant.

Guthrie, Okla.—The city council has appointed a special committee to investigate the feasibility of purchasing the electric light plant, believing that better service at a less expense can be secured.

Houston, Tex.—An electric light plant to cost $125,000 is to be installed here.

Ithaca, N. Y.—The Ithaca Wall Paper Company contemplates the erection of an electric light plant of its own.

Lockhart, Tex.—George Mohle has sold his electric plant to Mr. Bachman, and the system will soon be greatly enlarged and extended.

Lyons, Mich.—This village is ready to receive bids for the improvement of the electric light plant.

Madisonville, O.—At a recent meeting of the waterworks trustees the matter of purchasing a new dynamo for the electric light plant was taken up and discussed. It was decided to purchase a 75 light dynamo of 1,200 candle power.

Manti, Utah.—Manti capitalists are figuring on an electric light plant to be built at a cost of $10,000.

Marlin, Tex—M. Levy, who contemplates the erection of a new $64,000 hotel here, will install an electric light plant in the hotel.

Mazo Manie, Wis.—The electric light plant was recently destroyed by lightning. The loss is $35,000.

McKeesport, Pa.—An ordinance has been introduced in the city council providing for the building and maintaining of a municipal light plant in connection with the waterworks.

Mondovi, Wis.—There is talk of an electric light plant being owned and operated by this city.

Morrice, Mich.—The electric light plant at this place was burned recently. Loss $10,000.

Norwalk, O.—The city council is considering the feasibility of a municipal electric light system.

Poughkeepsie, N. Y.—At a recent special meeting of the village board, the contract to build the electric light plant was awarded to William M. Sheehan & Co. of 136 Liberty street, New York City.

Prescott, Ariz.—At a recent fire that wrought over $1,000,000 worth of damage to the business part of this city, the Prescott Electric Light Company's loss was $5,000.

Quincy, Ill.—The trustees of the Illinois State Soldiers' Home have decided to ask the Legislature for an appropriation of $428,200 for the maintenance of the institution for the two years beginning July 1, 1901. An electric light plant is included in the appropriation.

Richmond, Ind.—Last week J. B. Nelson, an electrical engineer of Indianapolis, contracted with the city council to draw up plans and specifications for a municipal light plant.

Saginaw, Mich.—Bids will be received at the office of the Board of Public Works until July 27 for furnishing all material and constructing a municipal electric lighting plant in this city. Address A. Davies, clerk.

Spencerville, O.—Bonds will be issued here for the erection of an electric light plant.

Stonewall, Miss.—T. L. Wainwright, secretary of the Stonewall Cotton Mills, wants estimates on an incandescent electric light plant of 800 lights including an engine to drive the plant.

Vineland, N. J.—By its favorable action upon an ordinance introduced lately for the construction of an electric lighting plant, the present borough council sanctioned the total expenditure of $175,000 for municipal improvements, including sewerage, a new town hall, electric lights and the purchase and extension of the city waterworks.

West Plains, Mo—An election will be held July 28 to vote on the question of issuing $27,500 in bonds for the purpose of erecting waterworks and electric light plants.

STREET RAILWAYS.

Battle Creek, Mich.—Detroit capitalists are interested in the proposed interurban electric road from this city to Hastings, and it is claimed that the road will certainly be constructed, work commencing this fall. The entire right of way has been secured.

Boyertown, Pa.—It has been definitely decided to build an electric railway between Carsonia Park and this place, and operations will be commenced at an early date.

Cherry Vale, Kan.—An electric line connecting this place, Independence and Coffeyville in Montgomery County and Neodesha in Wilson County is proposed by an Eastern company which will apply for a franchise.

Concord, Mass.—Plans are underway for the construction of a new electric road, to be called the Boston & Concord Street Railway. It is proposed to start it at the northerly side of the Boston & Maine tracks in Belmont and to extend it through the towns of Lexington and Lincoln to the public square in this city.

Crawfordsville, Ind.—The commissioners of Montgomery County recently granted a franchise for an electric line between this place, Alamo and Bluff Mills.

Danbury, Conn.—The Citizens' Steamboat Line, operating the day boats on the Hudson River, the Peekskill Traction Company, and the Danbury and Bethel Street Railway Company are interested in a scheme to build a trolley line from Peekskill through this place to Long Island Sound at Bridgeport or Norwalk. A meeting of the officers of the three companies will be held in New York City this week when an organization for the purpose will probably be made.

Florence, Col.—The Florence Electric Street Railway Company was lately incorporated in Fremont, Teller, El Paso, Pueblo and Custer Counties, with a capital of $500,000. Operations will be commenced within 60 days on its erection and equipment. H. A. Cook, James Reed and Harry Robinson are interested.

Jacksonville, Fla.—W. A. Bisbee lately applied for a franchise to build an electric street railroad in this city and suburbs.

La Porte, Ind.—The city council recently granted a franchise for the building of an electric railroad to the La Porte & Michigan City Railroad Company.

Laurel, Del.—A trolley line between here and Georgetown is being talked of.

Martinsville, Ind.—It is said the Indiana Street Railway Company has purchased the Martinsville gas plant and the Commercial Electric Light Company's plant at this place. The purpose of the company in making the purchase is reported to be the building of an electric line to Martinsville.

New Castle, Pa.—G. A. Townsend, of Chicago, is about to build an electric street railway line, which will connect this city, Sharon and Youngstown, Ohio. The lines will circle the three cities and will be fifty miles in length.

Niagara Falls, N. Y.—It is expected that the new electric road from Olcott to this place will be completed by August 1st.

Omaha, Neb.—The farmers here are interested in the proposed suburban electric railway between this city and Fremont. G. R. Williams is chief promoter of the project.

Orion, Mich.—A company has been organized to build an electric railway from Pontiac to this place and Oxford. G. E. Fisher, president of the Pontiac Standard Lighting Company is the leading spirit and Detroit, Pontiac and Toledo capitalists are interested.

Peaks Island, Me.—Louis B. Wheldon, formerly general manager of the Portland & Yarmouth Electric Railroad, was recently in Portland in the interests of Massachusetts and Connecticut capitalists figuring on a scheme to equip this place with a trolley line. The enterprise is financed and Mr. Wheldon says the road will be ready for operation at the opening of next season.

Pine Bluff, Ark.—W. H. Keiser, of Chicago, was recently granted by the city council a franchise to build and operate for fifty years an electric railway in this city.

Springfield, Mass.—There is some talk in Northampton of continuing the electric street railroad to Greenfield so that there may be a continuous road between this city and Greenfield.

Tremont, Pa.—A trolley road is to be built from West Woods through this place to connect with the line operating at Tower City, Williamstown and Lykens. Over 150 miles of electric railway track will be connected, and the system will represent an investment of between $3,000,000 and $4,000,000.

COMPANY MATTERS.

Cincinnati, O.—Last Wednesday the directors of the Bullock Electric Company re-elected George Bullock president, J. S. Neave vice-president, Stephen R. Burton treasurer, and J. W. Bullock secretary.

Leavenworth, Kan.—W. Murray and Paul Geiler lately formed a co-partnership, and having purchased the Leavenworth Novelty Works will do a general electrical construction and repair business and install electric fans.

New York City—The annual meeting of the New York Electric Equipment Company, was held in the offices at No. 572 First avenue, this city, last week. The election of Samuel Insull of Chicago, Martin J. Insull, of this city, and Philip H. Klein as directors was the only business transacted.

Pittsfield, Mass.—The Stanley Electric Company made a shipment of a car load of machinery to the Standard Electric Company of California last week. The consignment is a part of the equipment for the big transmission plant, which the local concern is going to install in the mountains of California, and consisted chiefly of lightning arresters, transmitters and other instruments.

MANUFACTURING.

Itaska, Tex—J. W. Hockaday is in the market for two 30 kilowatt dynamos, direct current, moderate speed 110 volts.

Syracuse, N. Y.—The May & Cornwell Company, dealers and jobbers in electrical supplies, has been reorganized under the firm name of the R. M. Cornwell Company. This concern manufactures hoods for arc and incandescent lamps, and will soon take up the manufacture of other articles. One of the branches of the business is to install electric plants. Frederick Storer is one of the parties interested.

POWER AND TRANSMISSION PLANTS.

Bloomington, Ill.—Among the improvements which the Alton has decided on in the rebuilding of its shops here is the installation of a central heating and power plant to cost $150,000. It will be equipped with three engines of 275 horse power and one of 150.

Massena, N. Y.—A company composed of English and American capitalists has purchased 2,000 acres of land here, adjacent to the St. Lawrence and Grasse Rivers. On this land an electrical installation of considerable magnitude is in course of construction. These works will ultimately develop 110,000 horse power.

Radford, Va.—The plants of the Radford Electric Light & Power Company and the Radford Electric Railway have been consolidated under one management. The water power about three miles from here will be utilized and a complete new electrical equipment installed. T. L. Pickle, superintendent.

Richmond, Va.—The Passenger & Power Company is considering the enlargement of the power-house, and the installation of new machinery. Specifications for these changes will shortly be submitted for bids. It is proposed to increase the aggregate power by 2,000 horse power. This will provide for emergencies and insure an abundance of motive energy at all times.

AUTOMOBILES.

Chicago, Ill.—The Baltimore & Ohio Railroad, which was the first to introduce electric automobile service in connection with its passenger trains, at Washington, D. C., established the service at Philadelphia on the first of June, following immediately with the introduction of the service at Chicago from Grand Central Station this month. The automobiles are of the latest electric pattern, provided with electric lights, etc. It has been arranged, when special service is desired, that passengers on trains approaching these cities, will notify the conductor of the train, who will wire ahead, and have the automobiles in readiness when the train reaches its destination.

Minneapolis, Minn.—Articles of incorporation of the Northwestern Motor-vehicle Company were filed a short time ago, and within a few weeks this city will have a public automobile cab service, operated along the same lines as the public cab service in the large Eastern cities. The officers of this new concern are H. H. Thorpe, president; Edwin Holt, vice-president, and W. E. Wheeler, secretary and treasurer. This company will also operate a line of cabs in St. Paul.

New York City.—A recently organized concern known as the Stanley Automobile Company will manufacture automobile patents in this city. The directors are: Amzi L. Barber, S. T. Davis, Jr., Frederick D. Foster of New York City; David S. Walker and John B. Walker of Tarrytown.

West Superior, Wis.—Manager M. R. Martin of the Superior Cycle Company is figuring on putting in an automobile manufacturing department in his cycle factory. He has already purchased considerable machinery for the purpose of making these machines and is now working on his first product of the kind.

Williamsport, Pa—The organization of a company to manufacture the Stutzman automobile, and opening the books for stock subscriptions, places the matter in proper shape for the public to take hold of the enterprise.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—July 23						
United Traction.......... (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000,000	1¾ % Q.,	124	125
Allentown Pa.—July 23						
Allentown & Lehigh Val. Trac. Co.	.	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—July 23:						
Bridgeport Traction Co....	100	2,000,000	2,000,000	1 % Aug.,	105	...
Baltimore Md.—July 23						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—July 23						
New England Street Ry....	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R............	100	10,000,000		2¼ % Aug. 99,	139	140
Brooklyn N. Y.—July 23						
Brooklyn City Ry.	100	2,000,000	1,928,400	....	232	233
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	48,000,000	....	58¾	58⅞
c Brooklyn Heights Railroad.....	....	200,000	200,000	....	107	109
*d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	2:7	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.......	100	2,000,000	1,884,200	2½ % Nov., '99.	326	850
Kings County Elevated..........	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co..........	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	77	80
f Atlantic Avenue Railroad........	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—July 23:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co..............	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.—July 23						
Columbus Street Railroad.... ...	100	8,000,000	8,000,000	1 % Q., Feb.	22	24
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	83	85
Charleston, S C.—July 23						
Charleston City Ry. Co.......... ..	50	100,000	100,000	8 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—July 23						
Chicago City Ry. Co...............	100	12,000,000	12,000,000	8 % Q., Dec. 81, '99.	245	250
Chicago & South Side R. T. RR....	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR...........	100	10,000,000	10,000,000		10	10½
Metropolitan West Side Elev. Ry...	100	15,000,000	7,600,000	Feb 28 1900.	27	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	77	78
North Chicago Street RR............	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR............	100	500,000	249,900	....	200	203
South Chicago City Railway........	100	2,000,000	1,603,200	....	..	..
West Chicago St. RR. Co............	100	20,000,000	18,189,000	1½ % Q., Feb.	108	103½
Union Traction Ry.. ....com.	....	1,250,000	624,900	35 %	14¼	15⅛
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	ι4	67⅛
Cincinnati, Ohio.—July 23:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
!Cincinnati Street Ry. Co...........	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	12›
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126¼	127
Cleveland, Ohio.—July 23.						
Akron, Bed. & Clev. Elec. Ry.......	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry...................	100	8,000,000	7,600,000	8-5 % Jan.	100	101
Cleveland Electric Ry..............	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—July 23						
Detroit Citizens' Street Ry..........	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry..........	100	....	1,200,000	....	175	..
Rapid Railway Co..................	....	250,000	250,000	....	90	100
Detroit Electric Railway............	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—July 23						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway............	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street rail way operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U R & Elec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranteed by West Chicago Street Railway Company, lessee.
Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—July 23:						
Hartford Street Ry. Co..............	100	$4,000,000	$200,000	8 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	–
Holyoke Mass.—July 23.						
Holyoke Street Ry. Co.............	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—July 23.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	–
Indianapolis, Ind—July 23.						
**Indianapolis Street Ry..........	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—July 23						
Pennsylvania Traction Co..........	100	10,000,000	9,900,000	....	--	–
Lancaster & Col. Electric Ry.....	....	....	87,500	....	--	–
West End Street Railway.........	....	....	....	....	--	–
Louisville, Ky.—July 23						
Louisville Ry...................com.	100	4,000,000	8,500,000	1¼ %., April.	78	79
Louisville Ry.................... pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—July 23						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅝	68½
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—July 23						
Montreal Street Ry. Co..............	50	4,000,000	4,000,000	8 % S., M. & N.	260	261
Toronto Street Ry. Co....	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—July 23:						
Memphis Street Railway Co..........	100	500,000	500,000	....	25	–
New Haven, Conn.—July 23:						
Fair Haven & Westville RR.........	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville...........	100	700,000	800,000	....	..	–
Winchester Avenue RR.............	25	1,000,000	600,000	....	45	46
New Orleans, La.—July 23						
Canal & Claiborne RR. Co..........	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	. ...	......	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad..................	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway..........	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—July 23:						
Central Crosstown RR...............	100	600,000	600,000	2½ % Q.	265	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	184½
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	100	125
d Metropolitan Street Ry. Co.........	100	45,000,000	45,000,000	2½ % Q.,Feb.,1900.	156¼	156½
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	37
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	194	201
h Eighth Avenue RR...............	100	1,000,000	1,000,000	....	375	425
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	395	410
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	198	205
k Sixth Avenue RR............guar	100	2,000,000	2,000,000	....	203	210
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	425
Second Avenue RR..................	100	2,500,000	1,862,000	2 % Q., Jan.,	198	204
Third Avenue RR..................	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	50	60
*Union (Huckleberry) Ry...........	100	2,000,000	2,000,000	....	190	200
Newark N. J.—July 23:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	26½	26¼
United Elec. Co. of New Jersey..	100	504,000	504,000	1¾ % A.	19½	20½
Pittsburg, Pa.—July 23:						
Allegheny Traction Co...............	50	500,000	500,000	....	55	56
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	24½	24¾
Consolidated Traction Co.......pfd.	50	9,478,850	9,000,000	8 %, Nov.	63½	64½
p Central Traction Co..............	50	1,500,000	ǀ900,000	1½ % Nov.	69	70
q Citizens' Traction Co.............	50	8,000,000	‡8,000,000	6 % A.	72¼	72½
r Duquesne Traction Co...........	50	8,000,000	‡8,000,000	6 % A.	..	...
s Pittsburg Traction Co............	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	8,000,000	ǀ2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry...........	50	†3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..................com.	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co..................pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ǀ Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for $145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass—July 23						
Union Street Railway Co	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass—July 23						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—July 23:						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—July 23:						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—July 23:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—July 23						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡583,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co........ $12½ pd	50	30,000,000	29,930,450	....	38	8¾
bElectric Traction Co	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.'99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
ePeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	96	96¼
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	268
Rochester, N. Y.—July 23						
Rochester Railway Co	100	5,000,000	5,000,000	....	16	17
Reading, Pa.—July 23						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—July 23:						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry..........com.	50	500,000	500,000	....	20¼	21
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	69	71
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—June.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	375,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61⅛	68⅛
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—July 23						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
mScranton & Carbondale Trac. Co.	100	500,000	500,000	....	16⅛	...
mScranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—July 23:						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.—July 23						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—July 23						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—July 23						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. §	97⅛	97⅞
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—July 23						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	104¼	105
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	15	16
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—July 23						
*Worcester Traction Co.......com.	100	8,000,000	8,000,000	....	29	31
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb., '98.	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.—July 23						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1 %, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—July 23						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	145	145½
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	105¼	107½
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	188	185
New York.—July 23						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	104	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	52
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	112	118
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	118	123
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co	100	5,000,000	3,728,000	2½ % Q., Jan., '99.	168	174
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	1 5	...
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79¾	80
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—July 23:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co	100	......	......	....	61	66
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—July 23:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	34	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	131	131½
T.-H. Elec. Co..T. Secur., Series D.	..	......	......	....	77	77½
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	48	45
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	62½
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44	44½
New York.—July 23:						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co..........com.	..	......	......	....	82	92
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900.	131	131½
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	..
‖Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—July 23						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—July 23						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	75	80
Northern Elec. Light & Power Co	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co	10	187,500	187,500	....	20	--
Miscellaneous.—July 23						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	150	155
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98	100
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2 % Q ‡	201	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¼ % Q	181	182¾
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, '98.	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	108

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—July 23:						
American Electric Heating Co	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 26, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.—July 23:						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—July 23						
Electro Pneumatic Trans. Co	10	1,500,000	......	--	2½	3
United Gas Improvement Co..scrip.	50	10,000,000	......	--	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	--	22	28
Welsbach Commercial Co......pfd.	100	500,000	......	3 % Q	73	75
Welsbach Light Co	5	525,100	......	....	42	44
Welsbach Light Co., Canada.	5	500,000	......	....	1¼	1½
Pittsburg, Pa.—July 23						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—July 23						
*Barney & Smith Car Co.......com.	100	......	1,000,000	--	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	95	100
Billings & Spencer Co	25	......	......	....	82	.
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	57	59
Johns-Pratt Co	100	....	....	--	105	109
*Pratt & Whitney Co..........com.	100	......	....	--	2	4
*Pratt & Whitney Co..........pfd	100	....	......	--	40	50
Stillwell-Bierce Co..........com.	--	....	....	--	--	50
Stillwell-Bierce Co..........pfd.	--	....	....	2 % Sept 1, '99.	70	65
Shults Belting Co	10	500,000	....	....	80	90
St. Charles Car Co		....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—July 23, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	*118½	119⅛
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‡Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*123	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—July 23, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry...............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
'Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	182¾	187

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—July 23 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,835,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry...................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Juyl 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	300,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR..... cons mtg. 6s.	$150,000	‡$150,000	1912	‡M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co..........1st mtg. 5s.	850,000	850,000	1919	....	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	..
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—July 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized.
$600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—July 23, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry.....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s.	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s.	5,698,210	......	1948	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s.	200,000	200,000	1910	J & .	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co.................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	....	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—July 23, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	375,000	375,000	1930	J. & J	......	......
Citizens' Traction Co..............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,030,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Juyl 23, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Juyl 23, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s.	1,818,000	1,818,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st ,	1 000 000	000 000	191	J& J	17	118

*With interest.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—July 23, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.........................1st mtg. 5s	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—June, 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*—July 23, 1900						
Belt Ry. Co.........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................1s mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home. 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—July 23, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry...................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	103	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—July 23 1900.						
Delaware Gas Lt. Co.,........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—July 23, 1900						
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(July 23, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	121	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—July 23, 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co.................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—July 23, 1900.						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co.......................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16¼@16½c.; casting, 16@16⅛c.

The American Bell Telephone Company has declared a dividend of 2 per cent., payable July 28.

The Calumet & Hecla Mining Company has purchased the Shelldrake Lumber Company for $650,000.

The Harrisburg, Pa., Traction Company's receipts in the last fiscal year were $332,582.77, an increase of $10,000 over the previous year.

The stockholders of the Danville, Va., Railway & Electric Company have authorized an issue of $400,000 40 year 5 per cent. bonds. Part of the proceeds will be used for extensions.

The American Air Power and the Compressed Air companies have consolidated with a capital of $8,000,000, $755,000 6 per cent., preferred and $7,245,000 common stock.

The directors of the Edison Electric Illuminating Company of Boston have declared a quarterly dividend of 2 per cent., payable August 1 to stockholders of record July 18.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 16@18; New York Electric Vehicle Transportation, 8@8¼; New England Transportation, 1½@4½; Gramophone, 35@40.

Exports of general merchandise from New York last week were valued at $11,742,741, against $9,942,146 the preceding week, and $7,162,041 the corresponding period last year; from January 1 exports aggregate $324,976,594, against $252,601,828 the same period last year.

The New York Motor Vehicle Company, P. H. Flynn, president, capital $500,000, all paid in, which bought the Worcester Cycle Company's plant in Middletown, Conn., will start at once with 200 hands. The company is said to have orders for $1,000,000 worth of vehicles.

Within a few days the Metropolitan Street Railway Company of New York City will have completed a cross-over connector at Manhattan street and Amsterdam avenue connecting the present terminus of the Sixth and Amsterdam avenues line at 125th street with the Amsterdam avenue branch of the Third avenue system.

Judge Arnold in Common Pleas Court No. 4 has dismissed the demurrer and allowed the defendants to file an answer in the equity suit instituted by William L. Elkins and others against Whitney & Stephenson and others to recover $65?,000 in bonds and securities which figured in the consolidation of the Pittsburg traction companies in 1896.

Advices from Seattle, Wash., state that the Grant Street Electric Railway Company, which has for some time been controlled by the Seattle Railway Syndicate, has transferred its entire property to the Seattle Electric Company. The earnings of the Seattle Electric Company for May are: Gross earnings, $92,800; operating expenses, $64,458; net earnings, $28,342.

Bondholders of the United Electric Securities Company are notified that the American Loan and Trust Company, trustee under the several trust indentures of the company, has called for redemption at 103 and accrued interest to August 1, 1900, collateral trust 5 per cents of the company. Twenty-seven bonds of the fifth series are called, three of the sixth, the entire outstanding issue of the eighth series, and 117 of the eleventh series.

The North Jersey Street Railway Company, has filed with the City Auditor of Newark, N. J., the annual statement of its receipts for the year ended April 30, 1900. The report shows that the gross receipts on all the lines operated by the company were $2,653,990. The receipts in Newark, based upon the proportion of mileage within the limits of the city were $1,547,8?2. The company has paid to the city as a franchise tax 5 per cent.—$77,390—of the earnings of its lines in Newark.

The trustees of the Massachusetts Electric Companies have called a special meeting of the shareholders to be held on July 30, the transfer books for both preferred and common shares will be closed from July 21 to July 31. The special meeting is called for the purpose of confirming the purchase of the South Shore & Boston Street Railway Company, and securing authority to issue new stock on the basis of one share of preferred and ¾ share of common stock for each share of South Shore & Boston stock. There are 6,900 shares of this stock calling for the issuance of $690,000 Massachusetts Electric Company's preferred stock and $517,500 common stock.

Justice Dugro, in the Supreme Court recently granted the Metropolitan Street Railway Company of New York City a writ of certiorari directed to the Municipal board of Taxes and Assessments, for a review of the assessment placed on the company's property for the year 1900, and returnable in October. The company alleges that its capital stock on the second Monday in January last was $45,000,000, of which $44,928,900 was paid up. The assessment fixed by the Tax Board was $4,022,800 on its real estate and $45,000,000 on its personal property. On application the Tax Board reduced the assessment on the personal property to $10,621,789 and to $4,017,800 on the real estate. The company claims these assessments are illegal on the ground that its indebtedness amounted to $38,983,233.75, and that its stocks in other companies, which were subject to taxation, amounted to $14,542,172. It claims that the total amount of its indebtedness and its holdings of stock in other companies should have been deducted by the Tax Board from the assessment.

The Appellate Division of the Supreme Court has decided that the Brooklyn Heights Railroad Company of the Rapid Transit system has the right to charge a ten-cent fare to Coney Island. The decision was rendered in the suit of Arthur Barnett against the company to recover $65 damages for being put off of one of the Third Avenue cars at Twenty-second street, Brooklyn, because he refused to pay the additional 5 cents fare demanded. All the Justices of the Appellate Division concurred in the decision, except Presiding Justice Goodrich, who did not vote. The decision was written by Justice Hirschberg, who stated that the grounds upon which the decision was based are that the Brooklyn Heights Company legally leased the Sea Beach Railroad; that the lease carried with it the right to charge an extra five-cent fare; that the Sea Beach Road received its charter before the one-fare law was passed; that the one-fare law did not refer to roads with a steam railroad franchise.

The Gold and Stock Telegraph Company, which is controlled by the Western Union Telegraph Company and which recently became engaged in a controversy with the Chicago Board of Trade on July 19, issued the following notice, signed by Thomas T. Eckert, as president: "The Chicago Board of Trade some time ago submitted a proposition to the Western Union and Postal Telegraph Companies, which demanded of the companies exorbitant financial terms, combined with impracticable conditions for the distribution of its market quotations. The companies endeavored to meet the views of the Chicago Board of Trade in every way possible, having made a liberal counter proposition. The result is that the Board has declined to accept the proposition of the telegraph companies, and has given notice that its market quotations will be withdrawn from the telegraph companies on August 1 next. This action on the part of the Chicago Board of Trade will after July 31, 1900, necessarily deprive our subscribers of the Chicago Board of Trade quotations as they have heretofore been sent out. We therefore give this notice to our subscribers that they may govern themselves accordingly."

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ELECTRICITY.

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

Electric Brakes Superior to Hand Brakes for Street Cars.

It is gratifying to note that the State Railroad Commission at Albany, N. Y., has at last completed its report on the tests of street car brakes. Last winter, as will be remembered, the Commission took up this question of the braking of street cars and issued a call to inventors of various forms of electric and other power brakes, inviting them to make a public test of their devices on cars placed at the disposal of the Railroad Commission by the Metropolitan Street Railway Company of this city. This invitation met with hearty response, and as a result experiments extending over several weeks were carried on on one of the lines owned by the above street railway company. The brakes tested were of almost every conceivable description, and the report just made public by the Commission treats of the results of the tests. The Commission says it was led to order the tests "by the alarming increase in the number of accidents happening on the street roads throughout the State, which the Board believed to be due to a large extent, to the inefficient brakes in use."

The report notes that "to-day there are electric street cars in service on various lines that weigh as high as twenty-three tons complete and have a speed capacity of over fifty miles an hour." It is stated, however, that the cars used in the larger cities weigh from ten to seventeen tons and are operated at a maximum speed of twenty-five miles an hour. In smaller cities the weight and speed are less.

In all, twenty-five varieties of brakes were tested on wet and dry rails. It was found that the average stop when the rails were wet was 71.73 feet and on dry rails 60 feet.

"Except in special cases," says the Commission, "where the liability to accident is very remote, the ordinary hand brakes now generally used should be replaced."

The Commission in its report does not recommend any particular make or type of brake, but it states that in order of merit, an electric brake stood first in the tests, friction brakes next, a hand power brake third and air brakes fourth.

The State Railroad Commissioners' report bears out the claim all along made by ELECTRICITY that there are excellent electric brakes on the market that should be adopted. That a more powerful braking mechanism than the hand brake now generally in use is needed is forcibly brought home by the number of accidents that are constantly occurring in the crowded thoroughfares of this city. Such being the case now that the State Railroad Commission has decided after numerous tests that an electric brake is far superior to the hand brake, if the principal railway companies do not see fit to at least endeavor to protect the lives of the citizens by making use of up-to-date appliances, drastic measures should be adopted at Albany to compel them to do so.

* * *

Some Facts About the Anglo-American Telegraph Company.

During its existence the Anglo-American Telegraph Company has laid eight cables, the history of which is quite interesting. The first was laid in 1857-8, the others in 1865, 1866, 1869, 1873, 1874, 1880, and the last in 1894. The 1857-8 cable was a total failure; it broke in 1857, and then failed after a brief existence in 1858. But it must be remembered that not only the making and laying of cables was in its infancy at that time, but navigation by steam was still in its early days, and thus the cable project was abandoned for the time; in fact, nothing practical was done until 1865 when another attempt was made, the result being that the cable broke when about half laid, but the enterprise was completed in the following year. From 1866 to 1869 there were uninterrupted cable communications across the Atlantic; in the following year there was an interruption of thirty-one days, the next year, 1871, of one hundred and seventy-one days, followed by a year of successful operation with no interruptions in 1872. In 1873 this cable died, so that its total length of life was seven years.

The 1866 cable showed its first flaw in 1867, when there was an interruption of 99 days; in 1868, of 69 days; in 1869, of 93 days; in 1870, of 153 days, and in 1871, of 154 days. Then followed two years of uninterrupted business, followed, in turn, by an interruption of 92 days, with no further interruptions until 1877, when this cable also died, after a life of ten years.

The cable that was laid in 1869 showed no interruptions until the year 1872, and then only for 19 days; in 1873 there was a total interruption of 35 days, none in 1874, 1875, followed

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again by an interruption of 61 days in 1876, and this again followed by two years of uninterrupted business, bringing us up to the year 1879, when there was an interruption of 169 days, followed each year by interruptions as follows: in 1880, 50 days; in 1881, 202 days; in 1882, 186 days, and then another year of uninterrupted business. The interruptions for the next few years were as follows: in 1884, 8 days; in 1885, 65 days; in 1886, 87 days; in 1887, 343 days; in 1888, 216, and in 1889, 78 days; in 1890 no interruptions; in 1891, 56 days; in 1892, 134 days, and in 1893, 272 days; thus, during the total life of that cable, amounting to 24 years, the total number of interruptions was twenty, and the total number of days lost was 1,981, or about five and one-half years out of its life. The cost of the repairs to the company was, in round numbers, $150,000, and 1,100 miles of cable were employed in the repairs. It is an unfortunate fact that there are two ridges in the Atlantic ocean bottom, and it is over these two ridges that the breaks are always reported to have occurred.

The cable laid in 1873 seems to have been more fortunate, as no interruptions occurred until 1880 when thirteen days were lost; followed by another period of successive operation lasting until 1891, when there was a loss of 46 days, followed by another of six days in 1895; or a total interruption of 65 days, and of this the longest interruption at any one time was one and one-half months.

In the cable laid in 1874 there were no interruptions until the year of 1880, since that time there have been six interruptions, the longest of which was one year and two weeks. In 1884 the Commercial Cable Company laid a cable across the 1874 cable, and, while it might be simply a coincidence, yet it is rather noteworthy that the 1874 cable broke in the neighborhood of that crossing. An expedition was sent out to repair it, but failed, and not only failed, but increased the break until it was 125 miles in length. The following year the company repaired the break at a cost of 273 miles of new cable. The cost of the two expeditions for that purpose was in the neighborhood of $435,000.

The 1880 cable showed its first break in 1883, when there was an interruption of 42 days, followed by another of 16 days in 1884; of 21 days in 1891, and of 30 days in 1896, or a total interruption of 42 days. The latest cable laid by the Anglo-American Company is that of 1894, in which there have been no interruptions up to the present time.

The general impression seems to be that better material is used in the modern cables than was the case in those of the earlier construction, but it is claimed by the officials of the company that there has been no material improvement between the years of 1865 and 1894, and, in one particular element of construction—gutta-percha—there has been a very material deterioration, as there is so much adulteration, but in addition to this it must be remembered that a harder iron wire is being employed, and thus a greater breaking strain is being secured. The largest improvement is the covering of the iron wires with thin gutta-percha, which was first employed for this purpose in the cable of 1880; this prevents the wire from coming in immediate contact with the ocean bottom, and as a consequence, prevents oxidization.

From the above it will be seen that the Anglo-American Company has laid eight cables, and that it is at present operating four, all of which go in the same direction. Of the seven Atlantic cables belonging to the Associated Companies, Anglo, Direct and Western Union Companies, as many as four have been broken at one and the same time, as was the case in 1894, when four out of the seven were out of operation, but this was the only instance in which the number ran over three.

* * *

A High Speed Electric Railway Scheme.

From all parts of the world come reports of projected high speed railways, but probably the most daring proposed undertaking of all in this line is fostered by a company in New York City, capitalized, so it is alleged, at $5,000,000. This concern will in the near future construct an overhead structure on which specially designed cars operated by electricity will, it is fondly hoped by the promoters, travel at a rate of speed of 200 miles an hour.

From the comparatively meagre amount of information obtainable the proposed line resembles in several respects the invention of Mr. Behr in England, descriptions of which have appeared from time to time in these columns. The cigar-shaped cars constructed of aluminum will rest on a single rail laid on a trestle at adequate height above the ground, and will be propelled by a current of electricity taken from a modified form of third rail. Referring to the system the inventor says:

"Our cars are long and narrow like arrows, and the air resistance is about one-fourth that which any other system meets, for a vehicle carrying the same number of persons.

"Then, too, we have the bicycle system, and there is so little friction that only one-tenth of the power required on other systems is needed. A man who has only one-eighth of a horse-power can propel a wheel at the rate of nearly sixty miles an hour. This is because the whole weight, or nearly all of it, on a bicycle falls on the center of the machine. And as only one-tenth of the horse power is used, the weight is tremendously reduced.

"Our cars are light, being constructed of aluminum and only four feet in width, and are remarkably strong. They are to be lined with asbestos, and the sides will be perfectly smooth. They will be warm in winter and cool in summer.

"One beauty of our system is that it is impossible for our cars to fall from the tracks. The traction wheels, of which there are four in each car, carry roller journals and fit into the single traction rail. The magnetic brake when applied grips this rail securely. The rail is fastened to the ties by a single rivet of steel which goes through its center.

"Now, the security comes from the eight guide wheels which act as the trolley. They descend around from the bottom of the cars to the bottom of the ties, where there are two charged rails, one to take in the current through an insulated wire and the other to carry it away. These operate on springs and are under the rails. This makes the charged rails face downward under the ties, and so does away with the possibility of getting shocked on the track."

As compared to the ordinary railway car, the vehicles of this system will have but one-tenth the weight, will require but one-tenth the power and will, owing to their shape, offer but one-fourth the resistance to the air. They will be sixty feet in length, four feet wide and seven feet high, divided into twelve compartments, each accommodating four passengers.

Other advantages of such a system are set forth by the optimistic inventor as follows:

"With our elevated transcontinental railroads there will be no grade crossings, the road will be out of the snow in the winter, out of the dust in the summer; there will be no necessity for fencing, none for ditching or ballasting.

"The old trouble of the right of way will be done away with as the farmer can plough his field right under our structure without danger. The speed will not have to be diminished in running through towns as it does on the steam roads.

"As there is only a pivot to turn on, the sharpest curves can be made at top speed with perfect safety. In fact, in my experiments on short distance roads, I have turned twenty-five foot radius curves at a speed of 106 miles an hour."

Commenting on the future of such a system the same gentleman adds:

"I believe that this system will in time do away with much, if not all, of the steam passenger traffic between cities and in intramural railroads. It will undoubtedly take the mail and express business, but as it now stands is hardly fitted for freight."

Two hundred miles an hour would unquestionably be a great step in advance over our present methods of railroad travel. Unfortunately in this world "all that glisters is not gold," and it remains to be seen whether this high rate of locomotion can actually be attained in ordinary practice. As the company is said to be about to construct a line of this nature from Philadelphia to Atlantic City, a distance of fifty-five miles, an excellent opportunity should be afforded those interested of ascertaining whether the expectations of the inventor are fully realized.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The Prince of Naples, who succeeds to the throne of Italy on account of the assassination of his father, speaks several languages perfectly, and will be, it is said, the most accomplished monarch in existence. For the past five years he has been a close student of electricity, and it was his intention to tour this country next year and inspect all the large electrical works here.

Excellent results are reported to have been obtained by the French Government from experiments made with wireless telegraphy. It was found that communication could be obtained with comparative ease between the shore and a ship at the distance of sixty miles, only the height of the mast of the ship preventing longer distances being attained. In consequence of this success it has been decided to equip the French Mediterranean squadron with the necessary apparatus.

Following up the policy of substituting electricity for steam at all available opportunities, the Pennsylvania Railroad Company has equipped its machine shop boiler flange department with a complete set of electric motors, which are running all the heavy steel rolling and cutting machines in the shop. The experiment has proved perfectly satisfactory in

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every sense. A few figures recently compiled show that the cost of running the department has decreased enormously since the introduction of electricity. Machines which formerly cost from $2 to $5 per day to operate are now run for an average of eight cents. The success of this departure will have wide bearing favoring similar innovations in other shops.

A NUMBER of people at McKeesport, Pa., are interested in the use of electric light in connection with the stereopticon, and Mr. George Behr, chief electrician of the tube works of that city, has constructed an electric lamp of his own device, making tests in the presence of several persons, which have proven that as brilliant and noiseless a light can be secured from electricity as from any other source for stereopticon work.

WILLIAM E. HEAL, ex-county treasurer of Marion, Ind., states that he has his new electric glass-melting process almost completed. It is somewhat similar to the system used at Niagara Falls for producing carborundum. He claims that he has succeeded in reaching a temperature of 7,000 degrees, while that reached by natural gas is not more than 2,700 degrees. He has shown the process to a number of prominent glass manufacturers, and they are unanimous in the belief that it will revolutionize the industry. It will require only a small part of the gas now used in the tanks to furnish the necessary power to operate the dynamos for the electric process, and thus will cheapen the cost of the production of the ware.

FRANCIS G. HALL, JR., and Irving E. Burdick, seniors in the Sheffield Scientific School at Yale, have perfected a new electric rapid fire gun. Its inventors believe that the weapon is to become an important piece of ordnance, and with it they hope to revolutionize the use of automatic guns on modern naval vessels. Mr. Hall and Mr. Burdick came to public notice over a year ago by inventing the Yale submarine arc lamp, which is now in use by the United States and Russian navies. They have been devoting their spare moments at New Haven, Conn., for the past seven months to building and perfecting their gun. The gun resembles the Hotchkiss, being mounted on deck in a similar manner. Its distinguishing feature is a device by which the gun can be fired by electricity from any part of the ship. It is asserted that the device is entirely different from any other for which patents have been granted. Messrs. Hall and Burdick organized the Naval Electric Company, with an office in New York City, to carry on their electrical work. For several years prior to this their work has been done under the name of the B. & H. Electric Company, but so much marine work has offered itself that they were advised to devote their whole time to it after finishing at Yale.

A COMPANY was incorporated in Tillamook, Ore., in April, 1898, to operate a sawmill by electricity, and since that time the incorporators have been constructing their novel mill. The mill commenced cutting lumber about two weeks ago, and proved beyond a doubt that the plan of operating a sawmill by electricity is feasible. The company generates its electricity by water power. The water is flumed from a small stream, and runs a 50 horse-power water-wheel, in connection with which is a dynamo to generate the current to operate the mill. Wires are strung from the power house to the sawmill and are attached to the saws and other machinery of the mill. The peculiarity of the electric sawmill is that the carriage is above the log and carries two saws. They are so fixed as to cut both ways, making two cuts at the same time, and, instead of having to bring the carriage back and commence cutting at the same end each time, the saws cut as well coming back and they cut a log of any size. It is claimed that the mill will cut lumber at one-half the cost of other sawmills.

HUGH J. MCGOWAN, president of the Indianapolis Street Railway Company, is completing the plans for some novel floats that will take part in the Fall Carnival pageantry in October. Street cars will be used, and it is claimed the floats will be the finest in point of decoration ever seen in any festival of the kind.

WHETHER or not the Republican National Committee adopts the project favored by some of its members of stationing in available places throughout the country graphophones reciting speeches by prominent Republicans, the broaching of the project, says the St. Louis "Republic," shows that conditions have changed materially from those which prevailed during the campaign of 1896.

SWITZERLAND has, up till now, not been noted as a center for steel production, though her engineers have long held a high position in the mechanical world. Recently, however, a company has been formed to work the great deposits in the Bernese Oberland, where there are many million tons of ore available, averaging 50 per cent. of iron. It is intended to attempt to smelt the metal electrically, the large water power, cheaply obtainable, giving the plan a reasonable prospect of success.

IT is stated that tests recently made in Germany with electric motor vehicles show that the most favorable result, so far as capacity is concerned, which a superficial comparison of the tests disclosed, was the equivalent of a working output of about 60 watt-hours per ton of rolling weight over a distance of .621 of a mile. Steering and brake tests were also made with different speeds and conditions. These tests proved on the whole satisfactory. In testing the extreme possible speeds of the competing vehicles, one of the passenger cars traveling at the rate of 11.7 miles per hours showed a battery capacity of 87 watt hours per kilometer-ton. No light is thrown upon the question of durability of the batteries.

MANUFACTURERS of electrical supplies are endeavoring to obtain a revision of the railroad freight classification, which rates all of their products as first-class freight and some articles as double first-class. A suit in the United States Court is threatened to enforce the Interstate Commerce law provision against discrimination. Complaint is made that the electrical supply industry is seriously hampered because the railroads charge the highest rates for carrying electrical goods.

THERE has been some criticism of the New York Electric Vehicle Transportation Company, which some time ago bought the property and franchises of the Fifth Avenue Stage Company, because it has thus far failed to put more than three or four electric stages on the route and has continued the stage service with the antiquated stages that it received from the old company. The statement was made at the office of the Electric Vehicle Company that it was still the intention to substitute the new system for the old horse-power system at the earliest possible date. The trouble was that the subject of electrical stage service was comparatively new in this country and no one had had experience enough to know just what the requirements of the new service might be. When the old company was taken over by the new, three or four electrical stages were placed in service as an experiment and to study and complete the data necessary to the change of system. These experimental stages have been in service ever since and something of the requirements has been gathered from the experiment with them. New electrical stages are now in process of construction at the works of the company at Hartford, Conn., and when they are completed they will be placed in service on Fifth avenue. The delay has been due to the many new propositions to be met, and the time required to manufacture the new vehicles intended to meet modern conditions.

CONEY ISLAND has a gospel lighthouse. The light, an enormous electric affair, can be seen, not only throughout the Island, but for miles beyond. It is 85 feet above the ground, and it turns slowly around the compass. On the great light appear the words "Jesus Saves," in large text. The light revolves from north to east, then to south, to the west, and back to the north again. It was placed in position for the first time last Saturday night on the top of the tower which is built alongside the mission house in Surf avenue, and many a reveler staggering along paused as his eyes caught the words in the air.

ADVICES from Cumberland, Md., state that work on the new third-rail system, which the Baltimore & Ohio Railroad is installing in the Belt Line tunnel to take the place of the present overhead system, is being rapidly pushed to completion. When it is finished electric motors will be more extensively used in hauling trains through the tunnel. The current for the motors will be supplied by a rail running outside the wheel rails. To minimize the danger of shocks to workmen and others who may be obliged to use the tracks, the rail is encased between two pine planks set on edge, the top edge of the planks extending a little above the rail. The insulators consist of blocks of reconstructed granite.

STORAGE BATTERY cars were run last Saturday evening for the first time over the crosstown line of the Metropolitan Street Railway Company's system, connecting the West 42d and the East 34th street ferries. The cars were of the underground trolley type, the batteries being located beneath the seats.

WE understand from a Reuter's telegram, says the "Electrical Engineer," London, that the Powers are considering the laying of a new cable between the present seat of disturbance or base of operations in China, and some points such as Shanghai, Port Arthur, or Yokohama, through which more speedy communication could be had with Europe. According to the present tentative arrangements the expense of the undertaking will be borne jointly by the Powers. It is probable that the United States will be able to lay the cable in the shortest time, owing to the fact that a cable which is intended for inter-island communication in the Philippines could be diverted to China.

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FIRE PROTECTION FOR LIFE AND PROPERTY.

BY JEAN WETMORE.

The means for protecting life and property against fire has not kept pace with our structural and commercial metropolitan growth.

Our attention has repeatedly been called to the highly inflammable condition of the wharves and storehouses lining our river fronts, and to the millions of dollars worth of property either received from, or ready for shipment to foreign ports, all stored in flimsy, highly inflammable buildings, that can scarcely be truly dignified by any other term than sheds built on wooden piles. Our commerce has been rapidly increasing while our methods of preventing and fighting fires, and protecting life and property, have not essentially been improved during a decade.

It is conceded that new forms of quick fastening buckles have been substituted on the harnesses of fire engine horses, new hose couplings employed, and furthermore progress is indicated by adding clergymen to the fire fighting corps, but the fact is apparent that our present system of dragging inefficient, cumbersome, antiquated apparatus through our highly congested streets to reach distant conflagrations is as ridiculous in the light of well-known means, as are now the little hand pumps our travelers still find in foreign cities.

The recent Hoboken disaster is an example of others that may any day be repeated when aided by favoring winds. An immense amount of valuable, highly combustible property, piled upon wooden wharves, resting on wooden piles all covered with a highly inflammable, sunbaked, wooden, boxlike superstructure, sheltering cotton bales, oils, whiskey and what not and helplessly sandwiched in between—the great transatlantic prides of a great navigation company. What a travesty on human reason and foresight! When a fire occurs under such conditions can we consider it a visitation of Providence? With the whole Atlantic to draw from there was scarcely an effective gallon of it to be utilized at the critical moment. The unavailability of fire engines and fire boats gave another fallacious example of attempting to utilize heavy transportable fire fighting machinery.

Our great and rapidly growing shipping interests, as well as our modern office structures, require commensurate improved facilities for fire fighting protection.

We instantly communicate our thoughts to distant friends, we operate large industries from power generated miles away, we pull a fire alarm box and instantly scores of men, horses, ladders, heavy steam engines and coal supply wagons are started clattering through our crowded streets, which in the course of time arrive at a fire, often when it is too late. They stand by while $3,000,000 goes up in smoke and 200 wretched human beings die in terrible agony. They then take their inefficient clap trap back, and patiently wait for another alarm, and yet, the hand that pulled the box, could as easily have instantly switched into local electrically driven pumps a thousand available horse power, from central railway and electric light stations.

The money lost in the Hoboken disaster alone would have equipped the shipping interests on both sides of Manhattan Island with adequate and instantly available electric fire protection.

To secure this protection the city has no need at present of erecting expensive power plants, or to build conduits or fill them with costly insulated wires. These adjuncts already exist and are in constant operation day and night; they never shut down.

The dock owners have only to equip each dock with an electric pump and connect them by means of iron piping laid underneath, and out of the way, with iron hydrants conveniently located and supplied with dirigible nozzles capable of sweeping the dock throughout its whole length, and as well capable of playing on the adjacent wharves when necessary. Hose, which often proves worthless in such cases of need, may not even be employed; the operation of pulling down a switch will enable each dock to instantly borrow for temporary emergency purposes electric power from the existing electric light and electric railway mains, in almost unlimited quantities. It is to be further noted that each central station almost invariably has a reserve equipment for extra occasions.

By the time a cumbersome fire engine could answer an alarm, a dock watchman unaided would have all the freight washed into the river if he so desired.

Such an apparatus would be quite inexpensive, and this is why we add "that electricity, instantaneous in its operation, capable of transmitting great power effectively over long distances, practically annihilating time and space, will eventually be universally used in fighting harbor fires."

Experiments were recently made at Brest, in France, with wireless telegraphy, by Lieutenant Tissot. It is not stated what system was made use of, but he was enabled to receive very clear messages from the Masséna, 35 miles at sea. The Friant, arriving in port, also sent messages, and though sent to the same receiver they were only slightly mixed with those of the Masséna, and could be easily read. These and other experiments which have been made are with the view of the adoption of aerial telegraphy in the French navy.

ELECTRIC TRACTION ON CANALS IN BELGIUM.*

For some time past experiments have been tried in both Germany and France, with a view to employing electricity for towing on canals and rivers, but though the former country enjoyed all the benefits of State aid, the result in neither case was such as had been hoped by those who realized the wide field of usefulness open to the system.

The question was fully discussed at the Belgian Congress of Navigation held in Brussels on April 9, 1899, but none of the visitors brought forward any scheme of real practical value. M. Léon Gérard, late of the Brussels University, an eminent Belgian electrician, who has devoted much study to the transmission of electrical power to long distances, advanced, however, such an admirable and feasible project for the desired purpose, that all those present acknowledged that M. Gérard's designs left little to be desired, and that the difficulties previously met had been effectually surmounted.

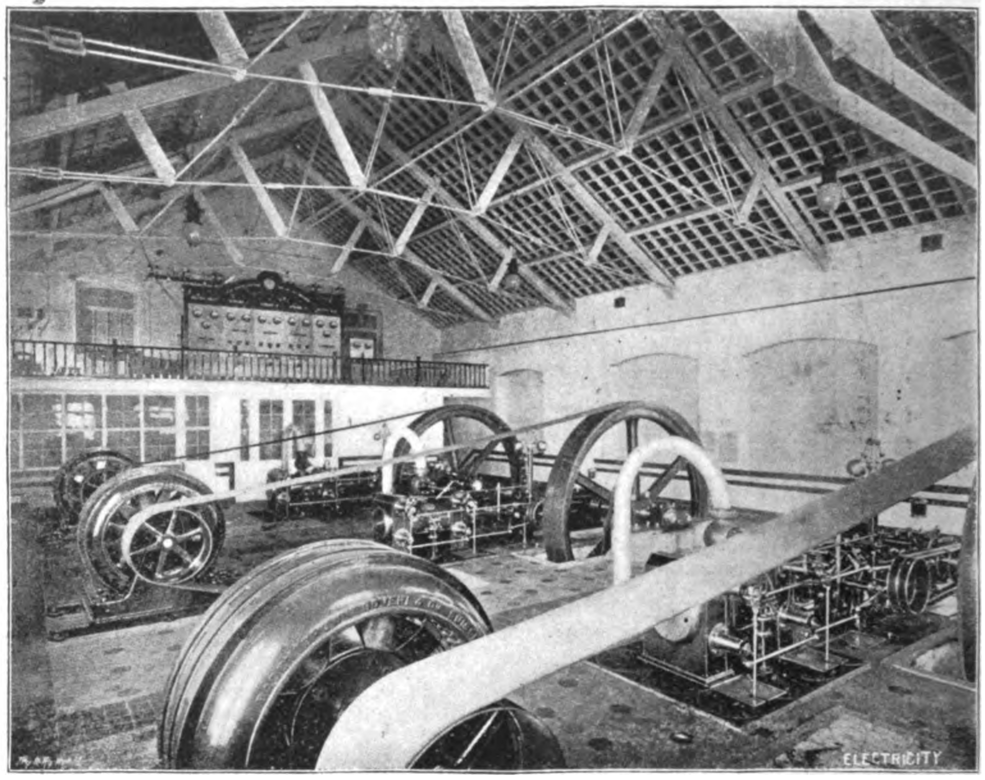

FIG. 1.—ENGINE ROOM AT OISQUERCQ SUPPLYING CURRENT FOR CANAL HAULAGE.

The "Compagnie de Traction Electrique" was then formed with M. Gérard as managing director, and his system has been installed on the important canal which runs between Brussels and that great center of the Belgian iron industry, Charleroi. This canal has a length of 50 miles, and there will be two depôts on it. One will be established at Roux, a village about 10¼ miles from Charleroi; the other is at Oisquercq, about 16¼ miles from Brussels.

Here three Germeau boilers of the Cornish type, two views of which are shown in Figs. 1 and 2, with two furnaces of 75 square meters (807 sq. ft.) of heating surface, work at a pressure of eight atmospheres (118 lbs. per sq. in.) The steam from these, after passing through a superheater is conveyed by a double system of piping to three single cylinder engines (Bollinckx-Corliss) of 150 horse-power, which run at 85 revolutions. The flywheels of the engines

* From the "Tramway and Railway World," London.

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drive in their turn, by means of cotton belts, three-phase alternators, made by Brown-Boveri, at 400 revolutions. Fifteen amperes are thus supplied at 6,000 volts, with 40 alternations per second. The alternating machines have 12 inductors, only half the poles being wound. The armature has a star-shaped winding, the conductors being insulated by means of mica. The exciters are four-poled Eickmeyer wound dynamos, which are driven from an extension of the alternator shaft. They develop normally at 42 volts, 12 amperes, and are designed so that one machine is capable of exciting the three alternators, even at the maxium load.

The switchboard, which is of white marble, is divided into five panels; three of these being for generators, and two for the sections of the line running up and down stream. The lower part is reserved for the exciters, which are coupled on the same bus bars. The feeders, which are entirely overhead, except at certain road crossings; are carried on yellow Russian pine poles, which are creosoted and placed about 123 ft. apart, and vary in height from 35 to 37 ft.

They carry two circuits of bare conductors, comprising:

Firstly, three primary wires of decreasing

FIG. 2.—POWER STATION.

section for 6,000 volts pressure. For the first four kilometers they are of the diameter of 5.5 millimeters, the remainder being of 3.4. The wires are placed on large blue vitrified three-bell insulators, sealed with sulphur, and tested to 12,000 volts.

Secondly, three secondary wires at a tension of 600 volts, of the uniform diameter of 5.5 mm. These are borne on double-belled white insulators, except in certain places where they have been made brown to diminish their visibility. There are in addition two telephone wires. The primary and secondary wires are throughout separated by a protecting net composed of three iron wires of three millimeters diameter, joined every three feet by a wire of two millimeters diameter, and earthed by lightning rods at each post. The lightning conductors have been made of barbed wire, so as to prevent the poles being scaled.

The lower conductors are about 18 feet above the ground, but at road crossings this height has been increased to nearly 20 feet, and the security of the traffic passing underneath is guaranteed by wire gauze which completely envelops the primary wires. Besides this there is a side net for the secondary wires, all being earthed.

Every three miles a shed has been built, in which is placed a transformer of 36 kilowatts, entirely submerged in oil. The transformers are protected by fuses on both primary and secondary wires as well as by lightning arresters. The fuses are easily removed, and thus serve to cut out any special transformer from the general circuit when necessary. Figs. 3 and 4 show the exterior and interior of the transformer huts.

The tractors, built entirely of steel, are provided with a motor of 5 horse-power, tested to

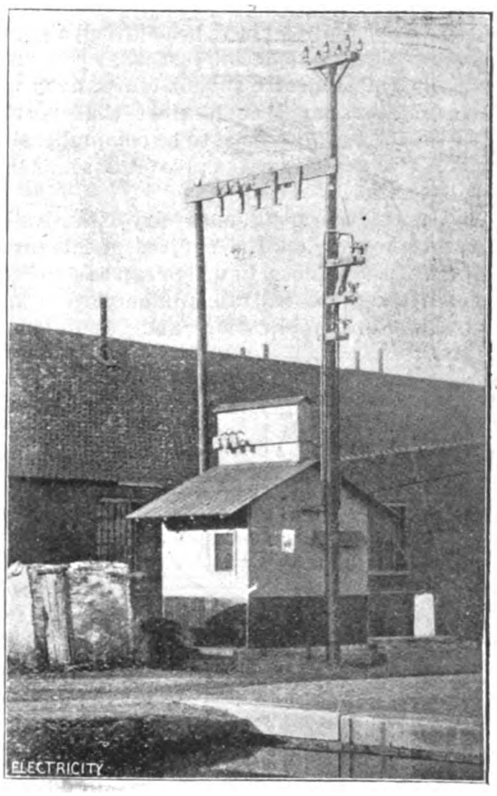

FIG. 3.—EXTERIOR OF TRANSFORMER HUT.

10. They work at an average of 7 horse-power, except on occasions of emergency when they can develop 20 horse-power. They weigh from a ton and three-quarters to two tons. Section

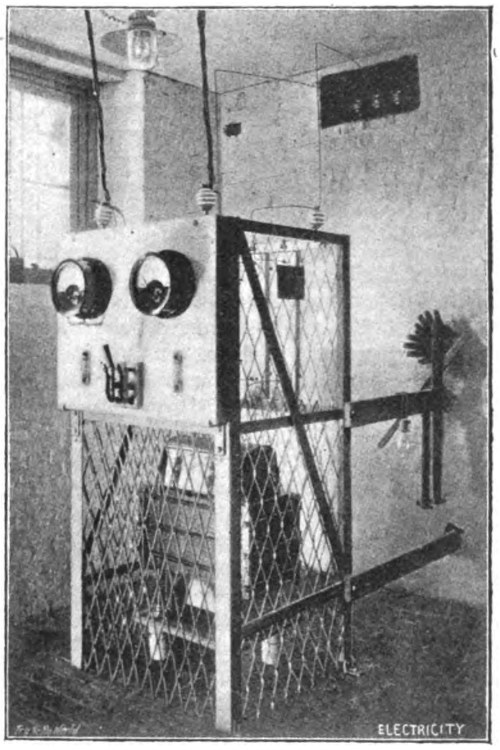

FIG. 4.—INTERIOR OF TRANSFORMER HUT.

and plan of the tractor, etc., are shown in Fig. 5.

The outside dimensions of the tractors are: Total length, 7 ft. 9 in., distance between the axles, 5 ft. 10 in.; width, 3 ft. 5 in.; height, 4 ft. 6 in. in one type of machine and 4 ft. 10 in. in another.

The motor, which is of 3-phase type, works at twice its normal load for ten minutes without an increase in temperature of more than 50 degrees, the efficiency of the machine being 80 per cent. A leather pinion with 12 or 16 teeth, according to the type of machine, is fixed to the axle of the motor and drives a shaft running at 116 revolutions. On this shaft is a clutch with which it is possible to drive a chain connected with the driving axle or with a conical winch on the other side. This arrangement forms, indeed, the specialty of M. Gérard's machine, and it will be easily understood that the extra power gained by the use of the winch is of immense service at certain times. Not infrequently the boats become wedged across stream, or other accidents happen which demand considerable power to start them again. The tractor itself might get into such a position (for the paths are not wide and are generally bordered by a ditch) from which only a very great amount of power could ensure its escape. The winch can develop an effort five times greater than the ordinary propulsion axle. The speed obtained from the tractor varies from 2 to 4.8 kilometers, with a mean effort of 75 kilog. per square centimeter (1,103 lbs. per square inch), while a maximum effort of 300 kilog. per square centimeter (4,412 lbs. per square inch) can easily be obtained on good ground. The tractor has four wheels—two for guiding in front and two for driving behind. The driving wheels have ball bearings, and are 200 millimeters wide, while those for guiding measure 120 millimeters.

There are two seats for the driver. Ordinarily he occupies that in front, and has under his control a three-pole switch for reversing the direction when necessary, the starting resistance, a brake and the clutch lever.

The tractor is supported on the frame by eight springs on each side, and is so arranged that no matter how uneven the road may be the wheels are always on the ground.

The current is collected by means of a triple trolley. Each of them has two wheels of aluminum bronze, with ball bearings and aluminum frame, and is provided with balancing weights. The trolley weighs 820 grammes.

Two spiral springs have been attached to the flexible cable which takes the current, and this ensures that degree of elasticity required to provide for the safety of the trolleys. Each tractor runs only over its own section of ground. It can draw five boats each laden with 70 tons, at a speed of a little over two and one-half miles an hour. In places where the pathway is too narrow to admit of passing, the tractors simply exchange boats and return on their own road. Otherwise they exchange trolley connection by means of an extremely substantial plug which serves to unite the trolleys with the circuit. The road is in most places level, but at the bridges there is a gradient of 14 per cent. These bridges are extremely low and narrow, allowing only 5 cm. (2 in.) on either side for the boats to pass through. Questioned as to the probability of the copper wires being superseded by aluminum, an experiment that is being tried in France as a consequence of the rise in the price of copper and a fall in aluminum, M. Gérard replied that he did not believe the latter metal would replace the former for electrical purposes from its want of stable resistance.

How rapidly M. Gérard has installed his

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system will be realized when it is known that it was only on April 7 in last year that the first boiler for the work was delivered at Oisquercq. On October 14 the first boat towed by electricity passed on the water of the Charleroi Canal, and from November 20 to December 9 no less than 740 boats were towed by the new plan along that portion which was then ready. For passing through towns where the river banks are covered with warehouses or other impedimenta, or in going through crowded locks, electric launches are used.

Beside the business of traction, the company finds that as power for towage is only required during the day, it is enabled to supply electricity for lighting purposes to the neighboring villages and communes. This is in great demand, and with the high tension available t even provides light to Roesbroeck, only four miles from Brussels. The lighting current is supplied at a tension of 220 volts by means of special 3-phase transformers. This is paid for at the rate of 55 centimes (about 11 cents) per kilowatt hour for private lighting, and at 30 centimes (under 6 cents) for public use. Driving power for factories from the same company is much employed at Charleroi, and by those factories nearer the Oisquercq station. This is supplied at a reduced tariff of 20 centimes for regular daily work of 12 hours, the current used being a 3-phase of 600 volts; 250 horse power has already been applied for, and 1,300 lamps are now in use.

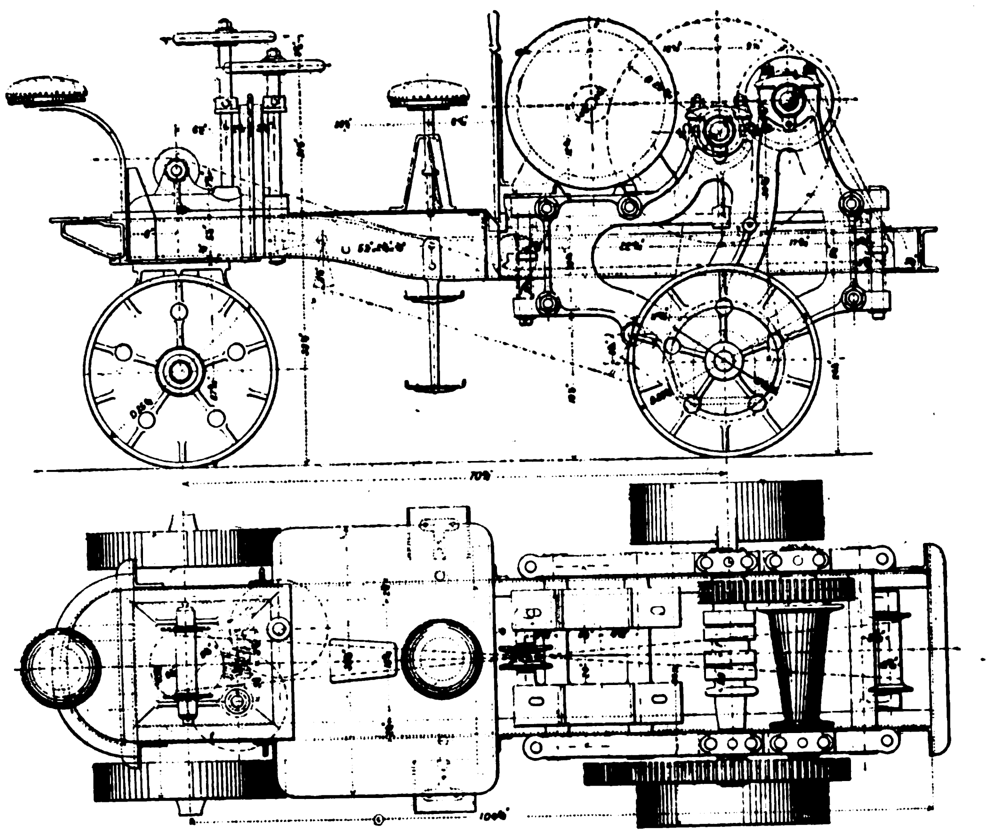

FIG. 5.—SECTION AND PLAN OF TRACTOR USED ON CANALS IN BELGIUM.

At a recent meeting of the Académie des Sciences, M. Henri Becquerel showed that, if on treating a fair quantity of chloride of uranium a very small quantity of barium chloride were put in, the precipitation was richer in active material. The radio activity of sulphate of barium then greatly exceeds that of the commercial uranium chloride. The material in question produced on a photographic plate wrapped in black paper a stronger impression than the uranium.

ELECTRICAL MEASURING INSTRUMENTS.*

BY J. FRANKLIN STEVENS.

In attempting a brief discussion of so broad and comprehensive a subject as that assigned me for this evening, I have been principally concerned in trying to decide just what portion of the general subject I should touch upon and in what manner I could treat that portion briefly, for I cannot hope to be comprehensive, and yet have my remarks present a semblance of coherence.

Since we have available a very extensive literature bearing on the subject of laboratory testing instruments, in which can be found descriptions of the instruments employed, their construction, application and approximate laws, I shall pass over that portion of the subject and confine myself to commercial direct reading indicating instruments, such as are to be found in every-day use.

The history of the art embodied in the commercial manufacture of indicating instruments is extremely interesting, but shows many analogies to the development of other branches of electrical engineering, with the single exception that practical data in published form is extremely scarce. Every one entering this field is compelled to master some of the most intricate problems known to the profession, and must learn for himself how best to apply theoretical deductions to practical mechanical devices. Until very recent years, our sole guide has been the study of early and primitive types which in their time were useful and valuable, but which to day fail to reach the high standard we have learned to demand of an instrument whose function is to indicate the input or output of our many and varied electrical devices. Every new device put before the public has meant a new condition to be met by the instrument manufacturer, requiring of him a new design or modification of an existing design. Two rather recent examples of this occur to me: one, the increasing tendency to employ high voltages in commercial work, reaching frequently 12,000 volts in the case of series constant-current arc light systems and 33,000 volts in long-distance power transmissions; the other, the rapid development of the electric automobile, which requires a volt-ammeter of as high a degree of accuracy as the portable laboratory instrument, yet able to withstand the roughest usage ever accorded an instrument of precision, coupled with restrictive specifications as to size and weight. In every instance instrument manufacturers have met the demands made upon them better, I think, than many of our fellow-workers have in some other lines. Much yet remains to be done, and much, I am confident, will be done in the matter of perfecting existing instruments in the near future. Gradually inefficient or unreliable types are being relegated to oblivion, and the remaining ones brought closer and closer to standard uniform construction.

The greater number of measurements required to-day can be made with a voltmeter, ammeter and wattmeter, and, while it might be thought that the wattmeter is merely a combination of the voltmeter and ammeter mounted in one case, this is not true in all classes of measurement. While it is true that the reading of the wattmeter represents the product of the readings of the voltmeter into the ammeter in the case of direct current measurements, it is not true in the case of alternating current measurements, save in the very exceptional case of a circuit possessing neither capacity nor inductance or a balance of the two. When either inductance or capacity exist there is a consequent lag or lead of the current wave relative to the pressure wave, and, since the instantaneous readings of the volts and amperes represent the mean effective or virtual values, that is, the square root of the mean square, their product differs from the reading of the wattmeter, which indicates the integrated values of two curves, the maximum and minimum values of which occur at different times. To obtain an agreement between the values obtained by volt-ampere readings and watt readings, it is necessary to multiply the volt-ampere readings into the cosine of the angle of lag or lead, so that the ratio of the watt readings, as given by a properly constructed wattmeter, to the volt-ampere readings gives us the power factor of the circuit, and from the two sets of readings we can readily determine the angle of lag or lead and the so-called wattless current. Probably this is well known to all of you, yet scarcely a week passes but I have to explain the matter to one or more customers who cannot reconcile the difference in the two sets of readings and are inclined to believe that some, if not all, of their instruments are indicating erroneously.

Before touching on the different types of indicating instruments which are most commonly found in commercial use, let us consider for a moment the essential requirements of a practical and satisfactory instrument for measuring voltage, current or power. To start with, the instrument must be direct reading. We have no time to-day to convert angular deflections into true values by means of tables of constants, but insist that the pointer shall indicate directly in definite units the value of the passing load or the impressed electromotive force. We must next be assured of the

* Paper read before the Electrical Section of the Franklin Institute, Philadelphia Pa., April 24, 1900.

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accuracy of the calibration, and for that depend principally upon the reputation of the maker or check the indications by comparison with a secondary standard. Beyond this we must know that the accuracy of the indications is not affected by the influence of ordinary external fields or by normal variations of temperature, due either to heating within the instrument, by means of the passage of the current to be measured, or to variations in the temperature of the room in which they are installed. All instruments should be mounted in dust-proof cases, and the systems carried in jewelled bearings; the movement of the pointer should be aperiodic or dead-beat, and, so far as possible, the system should contain nothing subject to change or deterioration, and should be constructed so that it will withstand successfully the ordinary rough usage liable to be accorded it in practice. The question of gradual change of accuracy, due to the change in some constituent part of the system, has led me to strongly advocate the use of electro-magnetic instruments with gravity control for switchboard use whenever the conditions render them applicable, and I fully expect to see this type of instrument become more popular, as its advantages become more widely appreciated. Such a system is not applicable for portable instruments, save the dynamometer system for alternating currents, and even then a spring control must be used: nor is the series electro-magnetic ammeter practical above about 1,500 amperes, due to the structural difficulties involved in carrying the bus bars directly to the instrument terminals. The one objection most commonly urged against the electro-magnetic instrument for direct current switchboard use is the unequally divided scale, for, as a rule, the scale only covers a range starting at 10 per cent. of the total up to maximum. In most cases, however, this objection is purely captious, for a switchboard voltmeter is seldom used to indicate more than 10 per cent. above or below the normal voltage, and the ammeter indications are of principal importance in the higher ranges to prevent a possible overload of the circuit or generator. In alternating current circuits an equally divided scale is an impossibility, so why should we sacrifice constancy in direct current measurements for the sake of an equally divided scale when the lower registers are so seldom used? In portable direct current instruments the proposition is somewhat different, as we desire to cover the maximum limits of possible measurement on a single scale instrument; therefore, an equally divided scale is desirable and practically necessary.

Taking up now the different types of instruments which are in most common use, we find they may be roughly divided into six classes, depending on the principle by means of which measurements of voltage, current or power are made: (1) the hot-wire; (2) the tangent galvanometer; (3) the electro-static; (4) the dynamometer; (5) the D'Arsonval galvanometer and (6) the electro-magnetic.

The hot-wire instrument is designed to operate by the expansion of a fine wire or strip of conducting material due to the heating produced by the passage of the current to be measured, and, therefore, the indications are proportionate to the square of the current. This type of instrument possesses the advantage of indicating with equal accuracy the current flow on either direct or alternating current circuits and is independent of the frequency of the circuit or of the shape of the current wave; it is, further, unaffected by the presence of external fields. These advantages, however, are all that can be claimed for this system, and to offset them are many serious disadvantages. Since the instrument operates by virtue of temperature differences, it is extremely susceptible to variations of external temperature, and such variations must be compensated either by mechanical means, which provide for bringing the pointer to zero by increasing or decreasing the tension on the working wire, or by providing auxiliary heating strips which are supposed to automatically adjust the tension of the working wire on the general principles of a thermostat. This may seem a small matter to most observers, but to me it signifies an error in principle, and reminds me of one of our early types of arc dynamos which, by reason of incorrect construction, was found to spark badly; so, in place of correcting the design, an air blast was provided to blow out the spark. Another point of objection is the constant change of zero, due to the fact that until the wire has been stretched to its elastic limit it will fail to return to the same point after having been stretched by the heat applied, and will always show a slight residual strain. To attempt to correct this prior to installation in the instrument means, judging by my own experience, that at least 90 per cent. of the wires will break during the preliminary stretching process, and the remaining 10 per cent. will stand but a very slight overload in service. As overloads are quite common, this would constitute a serious objection, for it means the return of the instrument to the manufacturer for the insertion of a new wire and recalibration. Another very serious objection is the amount of current required to operate the instrument. The average resistance of a modern hot-wire voltmeter is 4 ohms per volt, which means a current flow of .25 ampere. This low resistance effectually bars this type of instrument for accurate testing, since the amount of power abstracted from the circuit to be tested vitiates the accuracy of the results obtained and introduces serious errors, which must be allowed for in all calculations. Recently an attempt has been made to introduce the hot-wire instrument as a shunt ammeter, particularly for alternating current measurements. As a shunt ammeter, the hot-wire instrument is a distinct failure, for, while the manufacturers claim it can be operated on a drop of .3 volt for full scale, my personal experience has shown a drop of 6 volts to be necessary. On the makers' figures, 300 watts would be required to operate a 1,000 ampere ammeter, nearly .4 horse-power per instrument, while on the sample I have tested 6,000 watts, or 8 horse-power, would be required. Again, it has been shown that these ammeters when calibrated on direct current are not accurate within 10 per cent. when used on alternating currents, unless the reactance in the shunt is exactly equal to the reactance in the instrument, a condition almost impossible to obtain, even with the most careful design.

A modification of the hot-wire system has been proposed, consisting of an enclosed chamber containing a fixed resistance wire, one end of the chamber, which is made air-tight, consisting of a flexible diaphragm operating the pointer through a system of levers. In this case, the heat supplied to the wire by the passing current causes the air in the enclosed cylinder to expand and, consequently, puts the diaphragm under tension, very much on the principle employed in the aneroid barometer. I find by actual experiment that such a system could be applied to voltmeters, and could be so made that it would be accurate in its indications and would possess a reasonably high resistance. The feature, however, which renders this system impracticable is the slowness with which the readings can be taken. The pointer will not come to rest until after the heat supplied the air enclosed within the chamber is equal to the heat radiated by the walls of the enclosing chamber, and from one and a half to two minutes are required before the pointer will come finally to rest at the part of the scale marked to indicate the impressed E.M.F. This is true no matter how small the air chamber is made; and while it is possible to shorten this time by carefully covering the sides and one end of the cylinder by a heat insulating jacket, still it cannot be constructed so as to give an instantaneous reading, and every attempt to shorten the time by covering the walls of the chamber results in a corresponding increase of the time required for the pointer to come back to zero after current has been shut off. In other words, the instrument is similar in its action to an ordinary thermometer, which, as you know, cannot be made to respond instantly to changes of temperature.

Electro-static instruments, which depend for their action on the mutual attraction of two plates connected to the opposite sides of the line, are still used, but not extensively, for high tension measurements. They will indicate correctly on either direct or alternating current circuits, but are limited to measurement of voltage. It is impossible with this type of instrument to obtain a low reading, as the attraction of the plates toward one another varies approximately with the square of the potential difference between them. I say "varies approximately" advisedly, as the capacity of two plates varies directly with the square of the voltage only when the distance between the plates is maintained constant, which in this case is an obvious impossibility. As a rule, these instruments cannot be made dead-beat without introducing elements liable to seriously interfere with their accuracy; and, while there are no errors due to temperature changes, and while they are also extremely efficient, requiring no current flow at all, they are affected very considerably by external influences, particularly by static charges, which are almost invariably present in power stations or dynamo rooms, and, as you probably know, it is practically impossible to provide a shield for static effects.

Instruments employing the principle of the tangent galvanometer are still employed, and for certain classes of measurements are extremely useful. They can be particularly recommended for use as ground detectors or differential voltmeters, where the actual value of the indicators is of small moment, the particular object being to show a balance of two opposing voltages or the presence of a ground by deflection. In this system the magnetized needle is suspended vertically, and is acted upon by two equally and oppositely wound solenoids; that is, the solenoids are wound with two wires in multiple and then cross-connected, so that we have two circuits equal in effect but opposite in action. I might say in passing, that if the proper proportions of solenoids to magnetized needle are employed, and the length of the magnetized needle properly proportioned to its area, the tangent gal-

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vanometer instrument may be made extremely accurate and also quite permanent. Care must be taken, however, that under no conditions can the direction of the lines generated by the solenoids oppose the lines existing in the magnetized needle, otherwise the value of the calibration is almost instantly destroyed.

For measurements of alternating current voltage, and also for the measurement of the watt output of any alternating current source of energy, the dynamometer system, in one of its many modifications, is unquestionably the best type of instrument that can be used. This instrument indicates directly the mean effective voltage of the line to which it is connected, and is equally accurate for direct current measurements, provided readings are taken with the direct current flowing through the instrument in one direction, then the direction of the current flow reversed and a second reading taken, the mean of the two readings being the correct value of the impressed electro-motive force. This for the reason that the instrument is extremely susceptible to the influence of external fields. Further, the dynamometer type of instrument is only properly adapted for use in portable instruments. The fact that two readings are necessary on direct current prohibits its use as a switchboard instrument on direct current circuits, and its delicacy, coupled with its field of low intensity and its susceptibility to error, due to the presence of iron in its immediate neighborhood, whether used on direct or alternating current circuits, renders it impracticable as a switchboard instrument for alternating current circuits. As an ammeter, it cannot be successfully employed for measurements above .5 ampere, due to the difficulty of providing perfectly flexible contacts capable of carrying large currents. When you attempt to convey a current into a moving coil beyond the carrying capacity of a flexible conducting spring, recourse must be had to mercury contacts, and a mercury contact should never be employed in a portable or enclosed type instrument. In the dynamometer instrument great care must be taken to have the moving coil as light as possible; and to render the instrument aperiodic, or dead-beat, an aluminum air-vane, moving in a partially enclosed chamber, must be employed. Manually operated brakes acting on the delicate moving system should be avoided, as their continued use results in a serious derangement of the moving parts.

Instruments based on the principle of the D'Arsonval galvanometer are very extensively used to-day for both switchboard and portable instruments on direct current circuits; they can be calibrated so as to show an equally divided scale, and, if properly constructed, are an extremely efficient instrument. Further, they are very well adapted to the measurement of resistances and grounds. In the construction of this type of instrument the important factor is the permanency of the permanent magnet fields employed. It is essential in the first place, that the proper grade and quality of steel shall be employed, which means a steel possessing high permeability and a high degree of retentivity; then this steel must be carefully worked within definite limiting temperatures and must be treated with great care and skill in the process of magnetizing and aging. Further than this, the moving coil should be extremely light and the whole system carefully shielded from the influence of external fields, and yet so shielded that the moving coil will not be robbed of an appreciable number of lines of force, due to the presence of the shielding iron. The greatest field for this type of instrument is in the measurement of heavy currents; that is, for currents of 1,000 amperes and upwards, due to the fact that it can be operated as a shunt instrument, requiring an extremely small drop of potential, full scale being obtained with a drop of from .03 to .05 volt. This means a relatively high efficiency, and, while the instrument does not possess all of the advantages of a series ammeter, yet it is far easier to install, and, where a high degree of accuracy in current indications is not demanded, will be found very satisfactory in practice.

Further than this, the D'Arsonval instrument, which gives deflections directly proportionate to the current flow, lends itself readily to a large variety of measurements, such as determining resistances and measuring the drop of potential from which resistances and grounds may be readily computed. It is, however, a type of instrument which should be handled with great care, as rough handling or the presence of powerful external fields will permanently destroy the accuracy of its indications. Further, since it depends primarily for its continued accuracy of the maintenance of a field of uniform strength, as supplied by its permanent magnet field, instruments of this type should be frequently checked to ascertain whether the permanent magnets have maintained their initial strength.

A great deal might be said on the subject of the last type under consideration, namely, the electro-magnetic system, for there are probably more variations in practical construction contained in this type than in all the other types put together; some are good, many very bad. It is, however, unfair to adopt the policy of certain engineers, who unqualifiedly condemn every electro-magnetic instrument, solely and entirely on the grounds that they contain a moving mass of iron, which, in their opinion, must render the instrument subject to errors of lag and hysteresis. My practical experience with this type of instrument, covering a great many years, has taught me that it is perfectly possible to so construct an electro-magnetic instrument containing a mass of moving iron that errors of lag and hysteresis, if they are present, are so small as to be negligible. In order to achieve this result it is necessary first to proportion every part of the instrument with reference to all other parts; to carefully shield the instrument from the influence of external fields, and this by means of a shield that will not introduce errors due to its own retentivity. The iron employed should be very small and very light, and should be selected after careful test for purity and absence of retentivity. It should then be formed up with care, and so treated that oxidation is practically impossible. The field due to the actuating solenoid should likewise be carefully studied, and should be designed so that the moving iron will at no time be completely saturated, and yet of sufficient strength, in conjunction with the shield employed, as not to permit the indications of the instrument to be seriously influenced by external fields. In no case should two masses of iron be employed, as is common in some types of instruments, which depend on the repulsion of a moving vane by a fixed vane of similar polarity, both being energized by the actuating solenoid. It is almost impossible to free double vane instruments from errors of lag or hysteresis, and there is a further tendency for the pointer to stand off zero, due to the residual magnetism mutually induced in the two vanes.

The fact that the instruments constructed on the electro-magnetic principle contain no material subject to change or deterioration, coupled with the fact that they can be built solidly and substantially, and controlled by gravity in place of a spring or springs, renders them exceedingly reliable in practice. If their calibration is correct when first installed, there is no reason why the calibration should change with time.

In the above brief description of the most common types of indicating instruments, it may be noted that there is no one type which is universal, that is adapted for both switchboard and portable use for either direct or alternating current measurements. While we can very readily dispense with the hot-wire and electro-static instruments, the other four types are essential for some class of measurement, and for any particular line of measurement the most suitable system should be selected. It is possible that some day a universal system may be found, but until that time, the user must select from existing types the one which in principle seems most applicable, not only to the character of electrical energy to be measured, but also to the conditions under which measurement must be made.

(To be continued.)

PRACTICAL VS THEORETICAL.

(From the "Mechanical World," London).

What do we understand by the term "practical" man, and what are the characteristics indicative of the "theoretical" man? There need hardly be an apology for interrogating in this strain when reading some comments which have just appeared in an American electrical journal under the heading "Practical versus Theoretical." The writer, a Mr. D. F. Comstock, has been impressed more and more of late with the set-back given to the teaching of modern science by the indiscriminate use which is made of the terms "theoretical" and "practical." He cites the case of a professor —presumably an American—at a school of science, whose delight it was to emphasize to students the vast difference between the two results he was endeavoring to attain, with the consequence that there seemed to grow in the minds of the most susceptible a notion of two distinct phases of science, one of which agreed with everyday life, the other being some remote hypothetical study whose only value was a distinct resemblance to fact in points at long intervals. It is not uncommon to discover erroneous ideas as to the relative values of theoretical and practical experience and qualifications.

We are afraid that many a man who is looked upon as a practical engineer or scientist is deficient of much of the knowledge requisite to justify that appellation. Too often in the eyes of commercial men, in whose power it lies to mete out recognition, the man who wears overalls and potters about blusteringly among much machinery is regarded as a useful, practical man, while the young theorist with spectacles with a studious, absent-minded look, however great may be his real qualifications, is thought to be unfitted for a certain position because he has pursued his studies more deeply than another. As Mr. Comstock remarks, some time ago this notion seemed to pervade the minds of some leading American business men, who

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prized the unlearned but so-called practical machinist far more than the college graduate who was thought to be full of nothing but book. Happily there it is becoming realized that the theoretical is but a study of the practical, and that the practical man is often enough of little use at theory except in so far as he builds under competent supervision the parts which the carefully-evolved theories of his more studious confrères have made possible.

There are theorists who are far from showing any aptitude for practical work, as there are myriads of practical men who are sadly deficient as theorists. We are indebted to some modern dictionaries for the information that "theoretical" means "not practical," but happily there always have been in the world of engineering science men to whom it has been given to combine the two attributes. These have been the men who have risen from small things to become leaders—have by their industry done so much to maintain the supremacy of British engineering. One has not to seek far for proof that we fail to appreciate the theoretical man at anything like his real worth. More than one true worker has been lost to us because his sterling qualities have been better valued and rewarded across the Atlantic. Our losses have been America's gain, though science herself may not have been the loser by the transaction. Our niggardliness in this respect has left a serious defect in our national armor at which our rivals have not failed to direct their aim. Americans have found here countless opportunities to deride us on account of the scanty bread-and-butter pittance with which many of our men of knowledge and learning have to rest contented.

Theoretical knowledge alone is by no means at a premium over here; and the reason why the demand is so limited is because of a misconception of its worth. In more or less remote connection with this topic is the criticism which has recently been offered upon English engineering firms and their method of engaging travelers and representatives minus technical knowledge to act on their behalf. It is asserted that our transatlantic rivals go one better in this respect. They are not satisfied with a representative who knows merely the names of machines and their many parts—who knows the difference between a locomotive and a dynamo, but little more. In many cases they engage a thoroughly practical engineer—one who has passed through the schools and served his time in the shops. And is it not reasonable to suppose that such qualities, coupled with enterprise and commercial ability, or, in a word, "push," will bring about the best results from whichever standpoint we view the matter?

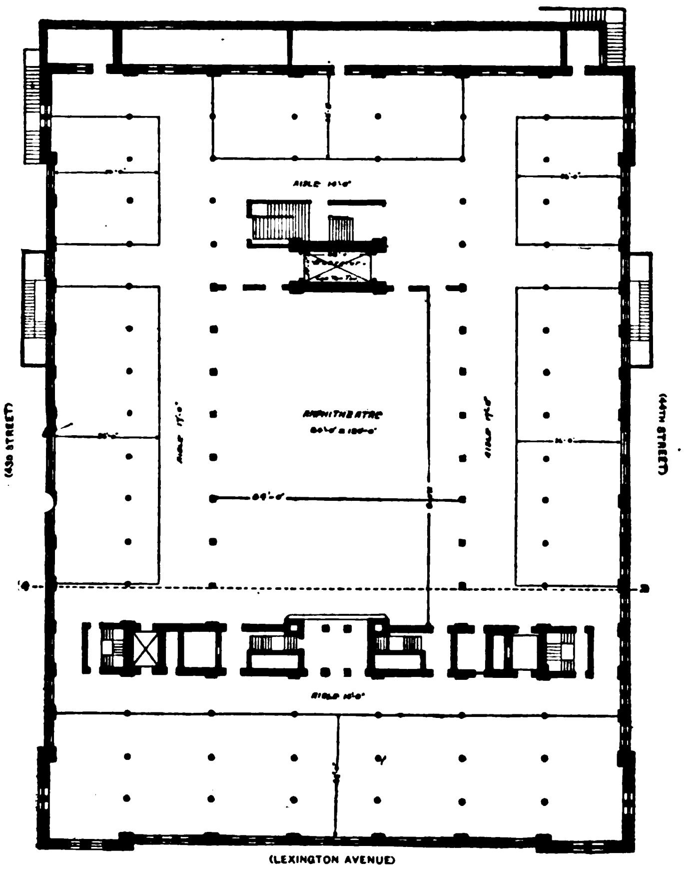
An Electrical Sweeper.

The Budapest Tramway Company of Budapest, Hungary, had in use last winter, according to the London "Electrical Engineer," an electric sweeping car for clearing its lines of snow. The apparatus chiefly consisted of an ordinary tramcar frame, under which, both back and front, were placed cylindrical brushes. The brushes were put in motion by a 20 kw. series motor and were made to revolve rapidly. The total weight of the car was 12.5 tons, and it ran at a speed of from 5 to 7½ miles per hour. The cylindrical brushes were of the same width as the track and had a diameter of 3 ft. 7 in. They were combined with four other brushes, made to move backwards and forwards, and specially arranged to clear dirt and snow from the metals themselves.

THE AUTOMOBILE EXHIBITION.

The early applications for space indicate that manufacturers are taking a keen interest in the automobile show to be held in the Grand Central Palace, New York City, from November 14 to 24. More than 10,000 feet of space has been signed up, and this, with the spaces selected but not yet signed for, will make fully half the available space disposed of almost four months before the exhibition.

In location, space and arrangement the Palace has many good points, while the fact that the automobile show will be open during the horse show week is counted a distinct advantage. The latter has grown to be so important a feature that an average of 50,000 people come from out of town to attend each year. The automobile show will appeal strongly to precisely this following, so that these 50,000 out-of-town visitors are not likely to return to their homes without attending the automobile show. The horse show as heretofore will be for one week only, the last six days of the automobile show, which will be open in all ten days.



Mr. Marcus Nathan, the general manager of the automobile show, is doing much to stir up an interest that will extend far beyond the present users of automobiles, a fact that should and no doubt will mean much to exhibitors. In addition to extensive and judicial advertising in the newspapers and by posters, an elaborate plan of circularizing is under way, so that practically everybody with money enough to own an automobile will be reached.

The representative character of the exhibits and their variety and completeness are factors in creating a popular interest. With this in mind the management made very low prices, abolished most of the usual extra charges and made all of the conditions easy. The result is already apparent in the large advance sale of space to representative concerns.

LONDON NOTES.

[From our London Correspondent.]

The Pacific Cable Scheme.

At last, after unconscionable delays, consequent in part upon the strenuous opposition of the existing cable monopolists, and in part upon the almost endless negotiations which have had to be conducted between the home Government and the interested colonies, the Pacific cable scheme has been laid open to tender. The announcement is that tenders are invited "by the Pacific Cable Committee on behalf of Her Majesty's Government and the Governments of Canada, New South Wales, Victoria, New Zealand and Queensland for the manufacture and laying of 8,272 nautical miles of telegraph cable in the Pacific Ocean, between Vancouver and Fanning Island, Fanning Island and Fiji, Fiji and Norfolk Island, Norfolk Island and New Zealand, Norfolk Island and Queensland." It is proposed that the undertaking shall be divided under three distinct contracts, for any one or more of which contractors may tender. The contractor will have to guarantee the good electrical condition and working order of the cables for thirty consecutive days after the completion of the laying. A fourth contract is also proposed for surveying and sounding the whole route before the cables are laid. Tenders have to be lodged with Messrs. Clark, Forde & Taylor, 4 Great Winchester street, London, E. C., on Tuesday, August 14. Although this matter has now reached the tendering stage, this is no warranty for saying that the scheme will, even now, be carried through. The present cost of the cable, etc., will be enormously higher than when the scheme was first set on foot, when the cost was put at between one and a half and two million pounds. It is quite certain that the bidders will be few in number, for there are not many who can undertake work

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of the kind. The Telegraph Construction & Maintenance Company, the India Rubber, Gutta Percha & Telegraph Works, W. T. Henley's Telegraph Works Company, Siemens Bros. & Company at any rate will be in evidence. But the suspicion, to which expression has lately been given, is that the cost will now be so great that the colonies may not be prepared to run to a greater amount than was originally anticipated. Further negotiations and other delays may even then follow, and with a dissolution of Parliament, likely to fall at any moment, the matter would appear to have some uncertainty. Cable manufacturers have been looking for these contracts with eagerness for some years.

Refuse Destructors and Electric Lighting.

The official opening of a municipal electric light and refuse destructor plant took place July 18 at Gloucester. A similar combination started at Darwen, in Lancashire, a few months ago is reported as giving very satisfactory results, and electric tramways are to be added. The Hackney (London) Vestry, whose district borders on to the memorable Shoreditch (where coal furnished such an admirable form of *refuse* once upon a time!) are proceeding with a combined scheme of considerable magnitude. The consultant acting for Gloucester and Hackney is Mr. Robert Hammond.

New Trolley Lines.

Within the past few weeks new electric trolley lines have been opened at the following places: Aberdeen (first section), owned by municipality; Southampton (first section of an extensive system) owned by municipality; Swansea (company). A twenty mile system is ready to commence running, being owned by the Norwich Electric Tramways Company. Although a cathedral city Norwich has had no tramways until now. At Dundee and Southport municipal lines are being opened. At Liverpool new sections are being started nearly every week. To give details of the equipments in each place is not necessary. They are all trolley lines and there are no particularly striking features.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended July 28:

Antwerp, 89 packages, $8,023; Australia, 5 cases electric motors, $777; 11 packages, $183; Bradford, 1 case, $34; Branderburg, 3 packages motor parts, $75; Brazil, 15 cases $829; 18 packages, $1,896; 18 cases motors and parts, $1,790; Berlin, 5 packages, $635; 1 case, $15; British Guiana, 18 packages, $5,339; British West Indies, 18 packages, $351; Central America, 5 packages, $69; China, 5 packages, $129; Cuba, 50 packages, $520; Dublin, 71 reels electric cable, $25,685; Dutch East Indies, 2 cases, $162; Genoa, 12 cases, $186; Glasgow, 72 reels electric cable, $29,039; 2 cases $125; Hamburg, 28 packages, $6,689; Havre, 192 packages, $12,802; 8 cases, $373; 3 cases electric instruments, $304; 8 cases automobile material, $500; 7 packages, motor material, $74; Hong Kong, 17 packages, $660; Japan, 98 cases, $4,595; Leith, 2 cases, $421; Liverpool, 60 packages, $11,613; 29 packages motors, $1,160; London, 165 packages, $14,420; 2 cases, $138; 63 reels electric cable, $13,932; 3 motors, $490; Manchester, 55 packages motors, $2,500; 7 cases, $541; Mariupol, 98 cases, $7,673; Mexico, 49 packages, $1,352; Naples, 39 cases, $7,899; Newcastle, 28 packages, $4,600; Peru, 10 cases, $496; Riga, 13 cases, $1,204; Rotterdam, 1 case, $10; Siam, 18 packages, $705; Southampton, 165 packages, $2,692; St. Petersburg, 81 packages, $6,415; U. S. Colombia, 106 packages, $3,450; Vladivostok, 11 boxes, $3,240; Zurich, 2 packages, $100.

PERSONAL MENTION.

Mr. Frank C. Wright, manager of the Dover (N. J.) Electric Light Company, has tendered his resignation to take effect October 1. Mr. Wright will go to Cuba as an electrical engineer for a syndicate under a three year contract in railroad and electric light construction.

Prof. Eleazer Darrow, of Spokane, director of the Washington State College, is in Pittsburg, Pa., studying electricity and its uses at the Westinghouse and other plants.

Mr. James Rush, who was formerly employed at the electric light plant at Bloomsburg, Pa., for several years, recently assumed charge of the power house of the Squier Electric Light Company of Williamsport, Pa.

Mr. J. A. Trawick, late of Boston, Mass., was recently appointed general manager of the Little Rock (Ark.) Traction & Electric Company.

Mr. E. A. Smith, formerly superintendent of telegraph on the Fitchburg Railroad, was lately appointed assistant superintendent of the Fitchburg division of the Boston and Maine road with jurisdiction of lines east of East Deerfield, Mass.

Mr. P. Bruno Kohler, Under Secretary of the Department of Foreign Affairs of the German Postoffice, arrived in New York on Friday from Bremen. His mission is to look after the interests of the German postal service in the laying of the new German cable from Coney Island to the Azores.

INCORPORATIONS.

The Dayton Electric Light & Power Company, Dayton, Ky. Capital stock, $50,000. Directors: H. M. Stegman and others.

The Granite State Electrical Works, Lisbon, N. H. Capital stock, $25,000. Incorporators: H. C. Libbey, H. H. Atwood, C. J. Currier, J. W. Richardson and W. Williams, all of Lisbon.

The Cattaraugus Electric Light & Power Company, New Albion, N. Y. Capital stock, $12,000. Directors: A. J. Setter of Collins Center, Frank Crawford and H. P. Bishop of Cattaraugus.

The Mt. Lassen Power Company, San Francisco, Cal.—to generate and dispose of electricity, etc. Capital stock, $1,000,000. Directors: A. Hochheimer of Willows, C. L. Morrill, F. Smith, A. F. Johns of San Francisco, R. M. Saeltzer and H. L. Shannon of Redding, and Park Henshaw of Chico.

The Genesee Electric Company, Rochester, N. Y.—to supply electricity for light, heat and power in Rochester. Capital stock, $50,000. Directors: P. H Flynn, Fred C. Cocheu of Brooklyn, and William A. Boland of New York City.

The Bath Electric & Gaslight Company, Bath, N. Y. Capital stock, $100,000. Directors: N. W. Dalton, M. A. Dalton and J. F. Parkhurst, all of Bath.

The Herkimer Construction & Improvement Company, New York City—to construct and equip railroads and telegraph and public works. Capital stock, $10,000. Incorporators: Robert Earl, Herkimer; Louis W. Stolesbury and Thomas E. O'Shea, New York City.

The Reuterdahl Electric Company, Saco, Me.—to make and deal in dynamos, storage batteries and generators of electricity. Capital stock, $100,000. President, Arvid Reuterdahl; treasurer, George F. Weston, both of Providence, R. I.

The New York & Queens Electric Light & Power Company, Albany, N. Y.—to operate in the Borough of Queens and in Nassau County. Capital stock, $2,500,000. Directors: Henry R. Wilson of New York City, Thomas W. Stephens and H. L. Snyder of Montclair, N. J.

The Ideal Electric Contracting Company, New York City. Capital stock, $1,000. Directors: Henry Nekritz, William E. McKeen and Adolf Hirschfield, all of New York City.

The Springfield Water & Electric Light Company, Springfield, Ky. Incorporators: J. H. Thurman and W. C. McChord.

The Washtenaw Electric Company, Ann Arbor, Mich.—to supply towns, cities and villages and their inhabitants with electricity for lighting, heating and motive power. The operations of the corporation are to be carried on at Ann Arbor and Ypsilanti. Capital stock, $50,000. Stockholders: Bernard Rorison, A. C. Rorison, William J. Clarke, P. M Miller, W. H. Sweet, C. L. Stevens, Robert Hemphill, Jr., A. Beyer, Robert W. Hemphill, Clark Cornwell, H. P. Glover and R. W. Hemphill, Jr.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED JULY 24, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

654,325. Automatic Switch for Electric Car-lighting Apparatus. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed March 12, 1900.

654,348. Trolley-Harp. Edward G. Johnson, Brigantine, N. J., assignor to the Edison-Johnson Electrical Manufacturing Company of New York. Filed Feb. 16, 1900.

654,448. Trolley-Base. Henry S. Goughnour, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 23, 1899.

654,574. Trolley-Track for Electric Railways. Victor Koch, Scranton, Pa. Filed Feb. 24, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

654,207. Incandescent Lamp. Samuel D. Washburn, Boston, and Clarence H. Tinkham, Cambridge, Mass. Filed June 25, 1898.

654,208. Incandescent Electric Lamp. Samuel D. Washburn, Boston, and Clarence H. Tinkham, Cambridge, Mass. Filed Jan. 23, 1899.

654,277. Electric-Arc Lamp. Henri Pieper, Fils, Liege, Belgium. Filed Dec. 28, 1897.

654,433. Incandescent Lamp Socket. William B. Bragdon, Cumberland Mills, Me., assignor to S. D. Warren & Co., Boston, Mass. Filed Oct. 31, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

654,239. Electric Switch. William Ely, Providence, R. I. Filed May 24, 1897.

654,299. Starting Mechanism for Alternating Current Motors. James J. Wood, Fort Wayne, Ind. Filed March 30, 1900.

654,410. Apparatus for Controlling Electric Motors. Frank A. Merrick and Emmett W. Stull, Johnstown, Pa., assignors to the Lorain Steel Company of Pennsylvania. Filed Nov. 22, 1899.

654,551. Means for Regulating Electric Motors. Robert Lundell, New York City. Filed May 19, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

654,326. Voice-Concealing Attachment for Telephones. Henry P. Roberts, Boston, Mass., assignor to Everett D. Godfrey, Taunton, Mass. Filed Jan. 15, 1900.

MISCELLANEOUS.

654,130. Electric Steering Gear. Harold W. Buck, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 20, 1899.

654,138. Electric-Current Grounding Device for Fire-Extinguishing Apparatus. William A. Dennett, Springfield, Mass. Filed March 14, 1900

654,187. Electrical Safety-Fuse. Arthur L. Stevens, New York City, assignor to the Pennsylvania Manufacturing, Light & Power Company of New Jersey. Filed Aug. 16, 1899.

654,310. Junction or Connection Box. Rudolf Hundhausen, Wilmersdorf, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Nov. 18, 1899.

654,317. Graphophone. Thomas H. Macdonald, Bridgeport, Conn., assignor to the American Graphophone Company, Washington, D. C. Filed Oct. 13, 1896.

654,320. Electric Heater. Robert R. Morison, San Francisco, Cal. Filed Nov. 15, 1899.

654,341. Damping Device for Recording Instruments. William H. Bristol, Hoboken, N. J., and Franklin B. Bristol, Naugatuck, Conn., assignors to the Bristol Company, Waterbury, Conn., and New York City. Filed May 24, 1900.

654,355. Electric Gas-Lighter. John Y. Parke, Philadelphia, Pa. Filed May 9, 1899.

654,367. System of Distribution. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Original application filed Sept. 10, 1897. Divided and this application filed May 18, 1899.

654,390. Induction-Coil. Reginald A. Fessenden, Allegheny, Pa. Filed Dec. 1, 1899.

654,463. Electric Furnace. Henri Lebleux, Paris, France, assignor to La Compagnie Electrometallurgique des Procedes Gin & Leleux, same place. Filed July 7, 1899.

654,493. Attachment for Phonographs. Horace Sheble, Philadelphia, Pa. Filed Dec. 11, 1899.

654,498. Electric-Metering System. Frederic E. Town, Glencarlyn, Va. Filed May 11, 1900.

654,519-654,520. Secondary Battery. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan, New York City. Filed Oct. 2, 1899.

654,531. Electric Bell. Charles H. Furgason, Binghamton, N. Y., assignor of one-half to Eric Peterson, same place. Filed Oct. 2, 1899.

654,557. Secondary Battery. Donato Tommasi, Paris, France. Filed July 8, 1899.

DESIGN.

32,953. Frame for Telephone Calls. Joseph A. Williams, Cleveland, O., assignor to the Williams Electric Company, same place. Filed Aug. 21, 1899. Term of patent 7 years.

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THE TELEPHONE WORLD.

The new switchboard of the Chicago Telephone Company's Washington street exchange, which it has taken a year to install, has recently been completed. The switchboard occupies the entire eighth floor of the building out of range of the sounds from the streets below, and out of reach of most of their dust. The new switchroom is lighted from overhead, so that in fair weather the operators will have abundant illumination from the sun's rays. The switchboard extends around the four sides of the room, encased in mahogany cabinets, along which the operators are to sit. The system of signals and connections will be much simpler than that of the old board, and yet it is complicated enough because of new possibilities in the way of making connections, to be a complete puzzle to one who is not familiar with it. A few statistics showing the amount of detail involved in setting up the new board follow:

Number of wires entering building	21,600
Number of wires to switchboard	18,000
Number of spring jacks on board	194,460
Number of relays on board	7,910
Number of lamps on board	7,447
Number of soldered wire terminals in multiple jacks	1,161,400
Number of miles of wire in board	12,000
Soldered connections in board	2,000,000

The Automatic Telephone Company of Springfield, Mass., wants a long distance connection with the Massachusetts Telephone Company, which was recently granted permission to put its line through Springfield. The long-distance line is being built from Boston to New York and points west, and the workmen are now busily engaged stretching the wires near Worcester. By the terms of the franchise given the company by the Springfield city council, the company cannot establish a local business. On the other hand, the weakness of the case of the Automatic Company was in the fact that it could not offer its subscribers, a long distance connection to compete with the rival New England Company. It was natural, therefore, that the Automatic Company should look to the Massachusetts Company to furnish the deficiency in its service. This was pointed out at the time the Massachusetts Company was granted the local franchise. No definite step toward an agreement between the companies had then been taken, but now it is said that the Automatic Company has approached the other corporation with this proposition. No answer has been given, but those who pretend to understand the situation say that there is little doubt that the Massachusetts Company will make the arrangement desired. This will mean that the subscribers of the Automatic Company will be given approximately the service with the large cities that the subscribers of the New England Company are now getting. If this is accomplished, it will be a victory for the Automatic Company.

The telephone company in San Francisco, Cal., must pay a separate tax for the nickel-in-the-slot attachment to its telephones. That is the effect of a decision rendered on demurrer by Police Judge Fritz in the cases of President John I. Sabin and Secretary Fred W. Eaton of the Pacific Telephone & Telegraph Company. The corporation, through its representatives, were accused of having failed to pay both the regular license on telephones and the license on nickel-in-the-slot devices, and of having failed to furnish the tax collector with a list of its subscribers. It was urged as a defence by the telephone company that the imposition of a tax of 50 cents a quarter on each telephone repealed that part of the nickel-in-the slot machine ordinance relating to telephones. This was the main point in the demurrer filed by the defendants. As to this contention the decision says: "The court is of the opinion that a nickel-in-the-slot attachment is not necessarily a part of a telephone instrument, and there may be a tax imposed on an instrument and also on any attachment that may be placed upon it."

The local anti-Bell Telephone Company in Duluth, Minn. expects to announce in a month or so the completion of arrangements for toll lines connecting Duluth with all the surrounding iron, mining, and lumbering villages of the district. The company received its franchise 17 months ago, and has in full operation an exchange of 1,300 subscribers in Duluth and 600 in Superior, the two systems being connected. The company claims that it has 60 per cent. more 'phones in use in Duluth than the Bell Company.

According to news received from St. Louis, Mo., City Counselor Schnurmacher has recently notified the Kinloch Telephone Company that unless the company files statements of its earnings and pays 5 per cent. thereon to the city, that its license to occupy the streets with conduits will be revoked. The general ordinance applying to wire-using companies makes this a condition of the Kinloch contract, and in accepting its provisions, the company filed a $20,000 bond with the Mississippi Valley Trust Company as surety. The reports of half yearly earnings should be made on the first day of January and the first day of July. Although the attorneys of the Kinloch Company have informed Mr. Schnurmacher that they will give his letter their attention it is said that the claim will be made that the company pays all its taxes as other corporations do, and to pay this extra 5 per cent. is equivalent to paying an income tax. They maintain that an income tax has been held to be unconstitutional. If this contention it adhered to the City Counselor will file suit against the company or its sureties.

Two young inventors of Chicago are arranging to give a public exhibition this week of a device for communicating with besieged towns in war times by means of telephones carried by box kites. They are Edward E. Harbert, electrician, 1007 West Van Buren street, and Raymond L. Anglemine, 281 South Paulina street. The kites used by the experimenters are box kites of the Eddy pattern, each 18 feet long, 2 feet wide and 1 foot high. Two kites fastened together are used, and when the distance which they are to travel is great three or more sets of tandem kites are employed. Attached to the kite line, about 100 feet below, is a pulley through which runs a lightweight double conductor flexible wire of aluminum. Attached to the end of this wire, swinging free from the pulley is a telephone, and another telephone is ready for operation where the kite flyers have their position. The kite is sent up until directly over the place with which communication is desired. Then the telephone swinging below the kite is lowered by playing out the circuit wire and letting it slip through the pulley, drawn by the weight of the instrument, until the people beneath secure possession of it and are put in communication with the kite flyers. The kite flyers are enabled to tell when their telephone is directly over a given point by means of a stademeter. The inventors say that by means of the box kites they can effect communication with a place ten miles away when the wind is right, although the ground between may be held by a hostile force.

Harry B. Gates of Indianapolis, Ind., appeared recently before the State Board of Tax Commissioners, representing the New Telephone Company of Indianapolis, of which he is secretary, and submitted a statement as to the valuation of its property. The statement of the company to the State board shows its capital stock is $400,000, divided into 8,560 shares. It has 1,430 residence and 1,830 business 'phones. Its gross earnings from the time it began business—July 1, 1899—to April 1, 1900, are reported to have been $59,152.96. The net earnings are not given. It has telephone lines in the following townships in Marion County: Center, Warren, Decatur, Perry, Pike, Washington and Wayne. It reports 134.47 miles of wire in Center township, in which the city is located. The statement also showed value of stock to be $356,000; mortgages, $500,000; real estate, $24,550. There are also $800,000 mortgage bonds in the hands of the trustees unissued.

The Kineo and North East Carry Telephone & Telegraph Company of Kineo, Me., is extending its new line to the head of Chesuncook Lake, fifty miles into the wilderness of that State. The work will be completed by August 20. The line is now working between Kineo, the Northeast and the Northwest Carries and the Penobscot House on the west branch of the Penobscot River, the point of arrival and departure for the thousand of canoeists, sportsmen and tourists who annually make the famous west branch, Allegash and St. John trips. This will place sportsmen and others in the wilderness which lies about the Chesuncook Lake in almost immediate communication with the outside world, where before they were from 48 to 96 hours distant in cases of extreme necessity.

T. H. Ewing, the electrical engineer for the Plattsmouth (Neb.) Telephone Company, is about to rebuild and double the capacity of the independent telephone system at Nebraska City, which was recently purchased from J. C. Howe of St. Louis by Judge Paul Jessen, John W. Steimhart, N. A. Duff, Morton Bros., William Hayward and others. Work will be commenced at once and when completed the exchange will work in connection with the Plattsmouth telephone exchange.

Judge A. Van Wageman, of Sioux City, Ia., has completed the organization of a $1,500,000 company at Providence, R. I., to manufacture the Clark automatic switchboard, a device designed to eliminate the hello girl from the telephone business. By its use patrons make their own connections. The invention was conceived several years ago by E. A. Clark, Sioux City manager for the Iowa Telephone Company, but has never been tried except experimentally. It promises to accomplish admirable results in small exchanges.

The Glen Telephone Company of Montgomery County, N. Y., has increased its capital stock from $10,000 to $100,000.

A Curious Telephone Experiment.

Some curious experiments with telephones, provided with ordinary line wires, but devoid of battery or magnet, have been brought before the Societe Belge d'Electriciens by E. Pierard. The transmitting instrument is simply a vibrator. A metallic diaphragm touches, when vibrating under the influence of the human voice, a platinum point fixed to a screwed spindle; contact is really made between the point and a small platinum disk, fixed to the back of the diaphragm. If we place this vibrator in an electric circuit containing a battery and an induction coil, whose secondary comprises an ordinary telephone receiver, we can transmit musical notes, but not speech, because as in the original telephone of Reis, the harmonic overtunes are not produced. If we now remove both the battery and the primary coil, we can still hear, at a distance of 100 feet, music which would be quite inaudible to the unaided ear, though there is apparently no electromotive force in the combination, which, in fact, reminds one of the old string telephone. The action cannot be of the latter kind, however, for the wires may be quite loose, whilst the string telephone requires a stretched connecting string. The effect is increased if we place in the vibrator wire circuit, not a battery, but a coil whose secondary has the same resistance as the receiver coil. That is, we come back to the ordinary telephone arrangement, but we apparently dispense with any source of current. It was thought that the heat, conveyed to the diaphragm by the warm breath, might set up thermo-currents. But it suffices to tap the vibrator with a piece of wood. To settle the problem Pierard tried diaphragms of various metals and thicknesses. When the platinum point touched an argentan diaphragm (alloy of copper, nickel, zinc) directly, no transmission was observed; when, as before, a platinum disk was soldered to the argentan, tunes were transmitted. Zinc behaved in the same way; copper and iron gave a small effect without a contact plate, and a better one with the contact plate; aluminum, no effect at all, probably because platinum could not be soldered to it; brass proved not sufficiently elastic. These experiments seem to indicate that the electric motive force is due to the contact of different metals, the intensity of the effect varying with the area of the contact plate soldered to the other metal. A further experiment supports this view. Sounds were produced by making the ends of the primary rest on a toothed wheel of copper, fixed on an iron journal. When both wires touched copper, no signal was transmitted, when the one rested on the teeth, the other on the iron journal, the clicks were heard.—"Engineering," London.

The National Telephone Equipment Company of Detroit, Mich., lately filed articles of incorporation, with a capital of $100,000, to manufacture switchboard generators and telephone equipments. The president is E. H. Parker, formerly an officer and director of the Detroit Switchboard Construction Company, and prominent in the independent telephone movement until the local company sold out.

The New England Telephone Company is looking over the ground in Millbury, Mass., with the view of establishing a central exchange. With a guaranty of a few subscribers the office will probably be opened. This will mean a great saving to telephone users, and will lower the price of both local and long-distance 'phones. The cost of a chat with Worcester, Mass., will likewise be reduced from 15 to 10 cents.

The Inland Telephone Company of Oregon and the Pendleton system have been practically united, using the same central office in Pendleton. Residents on either line can now talk to any part of the country controlled by either company.

Capt. D. R. Edwards of Lawtey, Fla., is putting in telephone lines connecting all his turpentine camps, etc., with the central office in Jacksonville. He will have in all over 50 miles of telephone wires.

TELEPHONE INCORPORATIONS.

The Home Telephone Company, Lockport, N. Y.—to construct and operate a telephone line connecting the principal points in the County of Niagara. Capital stock, $125,000. Incorporators: M. B. Butler, Niagara Falls; George H. Frost, Buffalo; A. E. Lord, S. R. Rawson, I. H. Griswold, James A. Drake, F. H. Sudro and F. W. Martin, Elyria, Ohio.

The Fillmore Telephone Company, Fillmore, N. Y. Capital stock, $5,000. Incorporators: Charles Ricker, William S. Mills and John H. Howden, all of Fillmore.

The Otisco and Cedarville Telephone Company of Otisco, N. Y—to operate a telephone system between Otisco and Syracuse. Capital stock, $1,500. Incorporators: H. D. Pomeroy and I. W. Bardwell, Otisco; Lee Cummings, Navarina.

The Cedarville Telephone Company, Cedarville, O. Capital stock, $15,000. Incorporators: D. Brodpite, O. E. Brodpite, James H. Andrew, F. B. Turnhill and S. B. Rankin.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Ashland, Pa.—The Northampton Portland Cement Company and J. J. Heintzeman have made arrangements to buy the Charles Mann farm near Nisky and will convert the old grist mill into an electric plant to supply Ashland, Belfast, Stockertown and other places in that vicinity with light and power. Mr. Heintzleman is to manage the plant.

Atlantic, Ia.—The project of enlarging the electric light plant owned by this city is under consideration by the city council.

Aurora, Ill.—The city council recently granted a franchise to the Aurora Street Railway Company to operate an electric light plant in connection with its railway and power plants.

Beaver Falls, Pa.—The council of College Hill Borough, adjoining this place, recently instructed its light committee to plot the town for 30 arc lights, and to advertise for bids for the erection of an arc and incandescent electric light plant.

Carthage, N. Y.—The American Electric Light Company has decided to enlarge and improve its plant at once.

Charleston, S. C.—The city council has decided to erect a municipal electric light plant.

Chicago, Ill.—J. Holt Gates & Co., of this city, was lately awarded the contract for a new electric light plant at Centerville, S. D., and will install a 60 kw. Warren single phase alternator and switchboard, and will use the Bernstein system of series incandescent lighting.

Dalton, Ga.—The city has purchased the gas plant from the private company and contemplates the erection of a new electric light plant next season. S. McAuley, mayor.

Detroit, Mich.—The East Side Electric Lighting Company's plant was burned out last week, the loss being $15,000.

Dunkirk, Ind.—The Chicago Consolidated Power & Water Company will reconstruct the electric light plant at this place.

Elizabeth, N. J.—During a recent storm lightning struck the power house of the Suburban Electric Light Company, demolishing valuable machinery.

Fairport, N. Y.—The citizens of this place have voted to issue $2 ,00 in bonds for erecting a municipal electric light plant.

Forreston, Ill.—Plans are being prepared for the erection of an electric light plant at this place.

Grafton, W. Va.—A New York syndicate has lately offered the Grafton Gas & Electric Light Company $85,000 for its plant. The town is not a large one, yet the stock of the local concern has been selling at $150.

Hackensack, N. J.—Contractor Ferguson has commenced the erection of a new addition to the electric light plant.

Lakewood, O.—Bids are asked until August 10 for erecting an electric light plant complete. Address J. French, clerk.

Leadville, Col.—A new electric light company is to be started here. Dr. J. H. Heron and J. B. E. Smale are interested. An electric light plant will be erected.

Lutherville, Md.—The county commissioners are contemplating lighting this place with electric lights, as it is claimed that it can be done cheaper and better than with gasoline lamps.

Mantorville, Minn.—Electrician R. D. Harrison of Minneapolis lately closed a deal with this town to furnish an electric light plant.

Pine Bluff, Ark.—This city has granted a franchise to W. H. Keyser of Chicago to construct and operate an electric light plant here.

Salem, O.—The city council decided a short time ago to erect a municipal electric light plant.

Schoolcraft, Mich.—An electric light plant may be established for the use of the Commercial House here, and, perhaps, a plant large enough to light business houses.

Shamokin, Pa.—It was lately rumored that a number of prominent capitalists of this city had taken definite steps for the reorganization of an electric light company here.

Tekamah, Neb.—This city recently decided to have electric lights. A committee has been appointed to look into the financial part of the proposition.

Terrell, Tex.—This city has granted a franchise for erecting an electric light plant. D. J. Anthony, mayor.

Union Point, Ga.—H. P. Arnold, superintendent of the Greene County Electric Light & Machine Works of this place, wants prices on one 250 light dynamo, 3,000 feet of line wire, switchboards per dozen, and everything connected with a small electric light plant.

Uxbridge, Mass.—George Z. Taft recently closed the deal with the Uxbridge & Northbridge Electric Light Company over the prospective sale of land near the freight depot for an electric light plant.

Waterloo, Ind.—The citizens of this place are agitating the question of erecting an electric light plant.

STREET RAILWAYS

Absecon, N. J.—An electric trolley line to and along the shore road is among the things promised for the near future. A right of way has been secured to Pleasantville and this place and the line will probably be continued several miles beyond here. It is expected that the new road will be in operation by next summer.

Agawam, Mass.—The selectmen of this place recently granted to the Springfield Street Railway a franchise to run an electric road from the new Agawam River Bridge to the State line.

Akron, O.—It is proposed to build an electric railway between this city and Cleveland. The Cleveland and Southern Railroad Company is back of the project.

Amsterdam, N. Y.—The Fonda, Johnston and Gloversville Railroad Company lately purchased the Amsterdam Electric Street Railway and its lighting and power plant. The railroad will be equipped in first-class style and will be extended to Rockton and Hagaman, a distance of four miles.

Bellevue, O.—The city council recently granted a franchise to the Toledo, Fremont & Norwalk Electric Railway to lay its tracks through this place.

Berryville, Ark.—Berryville will build an up-to date air line electric railway to the depot, two and one-fourth miles north of here.

Camden, Me.—There has been considerable talk about an electric road from here to Liberty which would doubtless prove profitable, as summer boarders fishing parties and cottagers are attracted to, Georges Lake. There is an abundant amount of freight, both in hay, wood and lumber to pay, if proper facilities for carrying could be obtained.

Chattanooga, Tenn.—A recent fire destroyed the power house of the Chattanooga Rapid Transit Company, operating between this city and Chickamauga Park. Loss, $35,000; fully insured.

Chester, Pa.—The Philadelphia, Morton and Swarthmore Trolley Company in this city and county is one of the most peculiarly constructed roads ever built here. This company, which is to have in all about twenty miles of road in this county, has not issued a cent's worth of shares of stock, it has not placed any bonds on the market and has none to place. The road has been founded on the cash basis and is being built better than any road was ever constructed in the county.

Detroit, Mich.—The Michigan & Ohio Electrical Railway Company filed articles of incorporation last week with a capital stock of $200,000. It proposes to build and operate a third rail electric railway between this city and Toledo.

Franklin, Pa.—The Venango Traction Company was lately chartered to build an electric railway eight miles long in this place with a capital stock of $50,000. John B. Smithman, Lewis M. Davison. James H. Forbush, L. Milton and J. S. Crouch of Oil City are the directors.

Larchmont, N. Y.—The Larchmont Horse Railway Company has begun the work of extending its trolley line on the Boston Post Road, and will shortly have it completed from Mamaroneck to New Rochelle. It is rumored that the horses will be abandoned in October and the entire system will be run by electricity.

Milford, Mass.—It is claimed that there is a favorable outlook for the Milford & Uxbridge Street Railway Company which proposes to build an electric road from the end of the Milford, Holliston & Framingham line in Hopedale, through Mendon to Uxbridge.

New York City.—The New York, Westchester and Connecticut Traction Company recently completed plans to gridiron the whole eastern section of Westchester County and a part of Connecticut with a new system of trolley lines.

Oakland, Cal.—Bids are asked until August 6 for a franchise to build and operate an electric railway in Contra Costa County. J. E. Rodgers, clerk.

Ogdensburg, N. Y.—Charles S. Plank has started a movement to secure the extension of the electric street railway from here to Waddington, a distance of eighteen miles, passing through the town of Lisbon and connecting four United States post-offices.

Oklahoma City, Okla.—The council is considering the question of granting a franchise for an electric street car line in this city. G. B. Stone is the chief promoter.

Parma, Mich.—The village council recently granted a franchise to the electric road to construct a track through the village, work to be completed within eighteen months.

Raleigh, N. C.—President John Mills of the Raleigh and Cape Fear Railroad is talking of converting that road as far as Fuquay Springs, into an electric line.

Scituate, Mass.—Several Brockton business men have become subscribers to stock being issued for the construction of a new electric railway from Assinippi, through Norwell, Cohasset, North Scituate, Green bush and this place.

Springfield, O.—Harry Frey was granted a franchise a short time ago by the commissioners for an electric line to be built from here to Hillsboro via Clifton, Cedarville and Jamestown.

Three Rivers, Que.—There is a project afloat for the construction of an electric railway line connecting this place with Grand Mere, Shawenegan, St. Barnabe, St. Severe, Louiseville and Yamachiche. The principal promoters are Mayor Paquin and Mr. P. E. Panneton.

Tenafly, N. J.—It seems to be the wish of a number of the residents of this place that a traction trolley line, to run through this township from Englewood to Closter, should be built as soon as possible. It is claimed that the right of way can be easily obtained, and that the people not only stand ready to give the privilege over their property, but would be willing to subscribe for the enterprise.

Trenton, N. J.—The New Jersey and Philadelphia Street Railway Company, which is backed by Boston capitalists, has lately secured the upper Delaware River Bridge in this city, and by the first of January next expects to be running trolley cars over it from the center of this city to Philadelphia.

COMPANY MATTERS.

Fort Worth, Tex.—The Standard Light & Power Company will be sold complete under order of court, August 7, at auction in this city. The property of the plant consists of new machinery, power plants, miles of wire already strung, and invoices at not less than $65,000 can be bought for less than $25,000, and on almost any terms. Fort Worth has 35,000 people and one other electric company, but the latter company is unable to supply the demand for power. Further information may be had by addressing Thomas P. Martin, Jr., Fort Worth, Texas.

Madison, Wis.—Capitalists of Pittsfield, Mass., are endeavoring to have the plant of the Northern Electrical Company removed to that city and amalgamated with the Stanley Electric Manufacturing Company. It is said that $500,000 has been offered for the Madison plant.

MANUFACTURING.

Chicago, Ill.—The Pumpelly Storage Battery & Electric Motor Company of this city changed its name a short time ago to the National Vehicle Battery Company. Its object is to manufacture storage batteries, motors, etc.

Davenport, Ia.—The Watkins Automatic Electric Current Regulator Company, with a capital of $100,000, has been organized by Davenport and Chicago capitalists, and it is expected that it will shortly be doing business in this city. The company will manufacture the automatic electric current regulator recently invented by Daniel Watkins and now owned jointly by Mr. Watkins and Attorney C. J. Raymann. The patent has been granted, but for various reasons the backers of the company have not yet allowed it to be issued.

Denver, Col.—The Electric Wire Inflater Company was recently formed here to manufacture electric wire on a capital of $10,000. W. H. Smith, George W. Skinner, James A. Skinner, Thomas Keeley and Charles H. Toll are all interested in the concern.

Toledo, Utah.—The Toledo Electrical Power Company recently filed articles of incorporation in the office of the Secretary of State. The capital stock is placed at $50,000. The object of the concern is to establish and conduct an electrical milling and manufacturing business. Joseph C. Ome is president, F. M. Davis vice president, A. J. McCuistion treasurer, Phares Dinyon secretary.

Weston, W. Va.—The Weston Petroleum Company lately sold two big gas wells to a company of Pennsylvanians, headed by O. S. Carves, of Wilkes-Barre, to use the fuel in the manufacture of carbons for electric lights. The gas wells purchased have a capacity of 10,000,000 cubic feet per day, and a pressure of 900 pounds to the square inch.

POWER AND TRANSMISSION PLANTS.

Columbus, O.—There is some talk of a company being formed here to develop water power in Arkansas. James J. McGrath has secured the franchise for various electric lines centering at Hot Springs, Ark., for lighting the city with electricity, and for damming a stream passing the city for the use of the water for domestic purposes.

Watertown, N. Y.—The Watertown Electric Light Company recently purchased the woolen mill and its water power immediately above and adjoining the company's present plant. The purchase was made for the sake of the water power, which the company does not intend to utilize at once, but will hold in reserve until the growth of the city requires the addition to the power now in use.

AUTOMOBILES.

Brookings, S. D.—The Hub Auto-Carriage Company was recently organized here with a capital of $100,000. William H. Ashley, James A. Kilburn, Louis N. Fuller, T. Arthur Fuller, J. P. Cheever, Philo Hall, Geo. P. Hall and Frederick E. Lusk are all interested in the concern.

Toledo, O.—Only about one-fifth of the machinery of the Lozier Bicycle Works will be removed, the balance being left in the Toledo factory to be utilized in the manufacture of automobiles.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—July 30						
United Traction	100	$5,000,000	$5 000,000	1½ % Q.,	124	125
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—July 30						
Allentown & Lehigh Val. Trac. Co.		4,000,000	1,500,000	....	--	15
Bridgeport, Conn- July 30:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	105	...
Baltimore Md.—July 30:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—July 30						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	139	140
Brooklyn N. Y.- July 30						
Brooklyn City Ry.	100	2,000,000	1,923,400	....	232	233
Brooklyn Rap. Transit Co., tr certif..	100	43,000,000	43,000,000	....	66½	59½
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	257	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	2½ % Nov., '99.	320	335
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co.	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	77	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.— July 30						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co.	100	6,000,000	5,870,500	1 % Q. Dec., 99.	99	100
Columbus O.—July 30.						
Columbus Street Railroad....	100	8,000,000	8,000,000	1 % Q., Feb.	22	24
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	83	85
Charleston, S C.—July 30						
Charleston City Ry. Co.	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co.	25	1,000,000	250,000	....	--	--
Chicago, Ill.—July 30						
Chicago City Ry. Co.	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	247	250
Chicago & South Side R. T. RR.	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000		10	10½
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	27	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	77	78
North Chicago Street RR.	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	200	204
South Chicago City Railway	100	2,000,000	1,608,200	....	96	99
i West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	103	103½
j Union Traction Ry........com.	....	1,250,000	624,900	35 %	14½	15½
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	57	59
Cincinnati, Ohio.—July 30.						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—July 30						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry.	100	12,000,000	12,000,000	¾ % Q., Oct., '99	87	88
Detroit, Mich.—July 30:						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry.	100	....	1,200,000	....	175	..
Rapid Railway Co.	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.	100	250,000	200,000	....	100	110
Dayton O.—July 30						
City Railway Co..........com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co..........pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. R R. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—July 30:						
Hartford Street Ry. Co.	100	$4,000,000	$200,000	8 % S., Oct.,	150	-
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	-
Holyoke Mass.—July 30.						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—July 30						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind—July 30.						
*† Indianapolis Street Ry.	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—July 30						
Pennsylvania Traction Co.	100	10,000,000	9,900,000	....	--	-
Lancaster & Col. Electric Ry.	....	....	37,500	....	--	-
West End Street Railway	...	....	....	....	--	-
Louisville, Ky.—July 30.						
Louisville Ry..........com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry..........pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—July 30						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—July 30						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S., M. & N.	260	261
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—July 30:						
Memphis Street Railway Co.	100	500,000	500,000	....	25	-
New Haven, Conn.—July 30:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	-
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.—July 30						
Canal & Claiborne RR. Co.	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—July 30:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	265	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	100	125
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	154½	155
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	201
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	392	400
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	395	410
j Ninth Avenue RR........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR..........guar	100	2,000,000	2,000,000	....	200	210
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	431
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	198	204
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	50	60
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.—July 30:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57½	60
North Jersey Railway Co.	100	6,000,000	6,000,000	....	26	26¾
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	19½	20
Pittsburg, Pa.—July 30:						
Allegheny Traction Co.	50	500,000	500,000	....	55	56
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	24½	24¾
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	63½	64½
p Central Traction Co.	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co.	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co.	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	†3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..........com	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co..........pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass– July 30						
Union Street Railway Co.	100	$850,000	$850,000	3 %, Feb.	160	165
Northampton, Mass– July 30						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.– July 30.						
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65
Paterson, N. J.– July 30						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.– July 30						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.– July 30						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡583,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	300,000	300,000	8 % Feb. 1, '99.	75	76
Union Traction Co. .... $12½ pd	50	30,000,000	29,980,450	....	85	85¼
eElectric Traction Co.	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co.	50	1,000,000	....	....	48	...
fLombard & South Street Ry.	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry.	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
ePeople's Traction Co.	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
gGermantown Passenger Ry.	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	96	96¼
jCatherine & Bainbridge St.	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry.	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
jRidge Avenue Passenger Ry.	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖885,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	268
Rochester, N. Y.– July 30						
Rochester Railway Co.	100	5,000,000	5,000,000	....	14	14¼
Reading, Pa.– July 30						
j Reading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry.	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry.	50	1,080,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.– July 30						
Fourth Street & Arsenal Ry.	50	300,000	150,000	....	--	..
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	..
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	..
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	..	..
People's RR. Co.	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.....com.	50	500,000	500,000	....	20¼	21
United Electric Ry......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	67	6[illegible]½
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July, '99	--	..
San Francisco, Cal.– July.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63½
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa– July 30.						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	..
Springfield Ill.– July 30:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	..
Springfield O.– July 30						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.– July 30						
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.– July 30						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S.	§ 97½	97⅝
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.– July 30						
Belt Ry. Co.	50	500,000	500,000	....	..	..
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	102⅛	102¼
Columbia Ry. Co.	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry.	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	15	16
Metropolitan RR. Co.	50	1,000,000	453,900	2½ % Q.	..	..
Worcester, Mass.– July 30						
*Worcester Traction Co.....com.	100	8,000,000	8,000,000	....	29½	31
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb., '98.	105	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.– July 30:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1% Jan	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.– July 30						
American Tel & Tel Co.	100	50,000,000	28,450,700	4½ % Q., Jan.	144½	145
Erie Telegraph & Telephone Co.	100	......	......	1 % Q., Feb. 20,	96	97
New England Telephone Co.	..	10,804,600	10,804,600	$1.50 p. sh. Feb	188	186
New York.– July 30						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1¼ % Q.	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	104	106
*Commercial Cable Co.	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	43	51
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q., Feb.,	112	118
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	128
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co.	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan., '99.	100	108
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	60	95
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.		
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	3½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	3 % S., Jan., '99.	115	...
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99	79¾	80
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.– July 30						
American Dist. Teleg. (Phila.)	25	400,000	.....	1 % Q.	76	87
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	
Chesapeake & Potomac Telep. Co.	100	......	.....	....	6[illegible]	[illegible]2
Chicago Telephone Co.	100	......	.....	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	1[illegible]
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	.....	......	....	64½	65
Southern New Eng. Teleph. Co.	100	3,000,000	.....			--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.– July 30:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	46
†General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	.
General Electric Co. [new] "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	129	130
T.-H. Elec. Co..T. Secur., Series D.	..	......	......	....	77	77½
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	68
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44	44½
New York.– July 30:						
Edison Elec. Ill'g Co., New York.	100	9,128,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1½ % Oct., '98.	--	--
Edison Ore Milling Co.	100	......	......	....	8	12
Electric Vehicle Co.....com.	..	......	......	....	82	96
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q.,Jan., 1900.	129½	130½
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	130	135
Pittsburg, Pa– July 30						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	171
East End Electric Light Co.	50	500,000	300,000	Q	--	--
Philadelphia, Pa.– July 30						
Edison Electric Light Co.	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	80
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	70	85
Northern Elec. Light & Power Co.	10	550,000	550,000	......	12	12½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	80	--
Miscellaneous.– July 30						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co.	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	150	155
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91½	92
Rhode Island Elec. Protec. Co.	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q	‡201	202
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1½ % Q	131	132½
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1, '98.	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	165	166

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.– July 30:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 28, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.– July 30:						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co.........pfd	100	2,000,000	2,000,000	7 % A	108	110
Philadelphia Pa.– July 30						
Electro Pneumatic Trans. Co.	10	1,500,000	......	----	2½	2¾
United Gas Improvement Co..scrip.	50	10,000,000	......	----	.	162
Welsbach Commercial Co.....com.	100	3,500,000	......	----	21¼	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co.	5	525,100	......	....	42	44
Welsbach Light Co., Canada ...	5	500,000	......	....	1	1½
Pittsburg, Pa.– July 30						
Carborundum Mfg. Co.	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.– July 30						
*Barney & Smith Car Co......com.	100	......	1,000,000	----	13	15
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	91	93
Billings & Spencer Co.	25	......	....	....	32	.
Consol. Car Heating Co.	100	1,250,000	1,250,000	1½ % Feb	57	59
Johns-Pratt Co.	100	....	....	----	105	109
Pratt & Whitney Co.........com.	100	......	....	----	2	4
*Pratt & Whitney Co..........pfd	100	....	......	----	48	50
Stillwell-Bierce Co.........com.	--	....	....	----	--	50
Stillwell-Bierce Co..........pfd.	--	....	....	2 % Sept 1,'99.	70	85
Shultz Belting Co.	100	500,000	....	....	80	90
St. Charles Car Co.	-	....	....	----	80	100

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s	$500,000	427,500	1930	J. & J.	*118½	119⅛
‡The Albany Ry. Co......Gen. mtg. 5s	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR.1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127⅛
‖Watervleit Turnpike & RR..2d mtg. 6s	150,000	150,000	1919	M. & N.	*123	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co..... 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—July 20, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.		
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	

†Controlled by Charleston St. Ry. Co

Chicago Ill.

Date of Quotation—July 36, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1908	F. & A.	....	102
‡Chicago Passenger Ry....Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T...............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry......1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation July 30 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s	1,500,000	1,500,000	1913	M. & N.	......	....
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	..
Lorain (O.) Street Ry.........1st mtg. 6s	200,000	200,000	1915	J. & J.	.....	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked a.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—July 30 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	6,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Juyl 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,0 00	24,000	1912	M & S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La

Date of Quotation—July 30 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s	$150,000	‡$150,000	1915	M. & N.	......	....
Crescent City RR.............1st mtg. 6s	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1949	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	899,000	1909	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	99½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123½
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized
$600,000 in escrow to retire 6s due in 1901

Philadelphia.

Date of Quotation—July 30 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry...................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry...........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry......................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s.	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s.	200,000	200,000	1910	J. & .	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	....	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—July 30 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co...........1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,033,000	1934	J. & D.	......	......
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation - Juyl 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation - Juyl 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s.	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J & J	17	118

*With interest

PASSENGER RAILWAY.

St. Louis.

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co......................1st mtg. 5s	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation—July, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co..........................Cons. mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................'s mtg. 6s.	500,000	500,000	1914	A. & O.	182	....
Eckington & Soldiers' Home, mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

Miscellaneous.

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.

Date of Quotation—July 30 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	103
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......

Miscellaneous.—(Juy 30, 1900)

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,312,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	... ..	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation—July 30, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
					100½	101
American Bell Telephone.......................4s.			1908	F. & A.	......	
Northwestern Telegraph Co.................7s.	....	......	....	......	...	..
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—July 30, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co...............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co...........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co............................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¼@16½c.; Lake, 16½@16½c.; casting, 16@16¼c.

The Honolulu Rapid Transit Company's purchasing agent is buying cars in Philadelphia.

The Denver (Col.) Gas & Electric Company has declared a dividend of 1½ per cent, payable August 20.

Local capitalists have purchased the Portsmouth (Va.) Street Railway for a sum said to aggregate about $500,000.

It is reported that the New York Rapid Transit Commission has decided on a tunnel route from the Battery to South Brooklyn.

President Vreeland says the earnings of the Metropolitan Street Railway of New York for July show an increase of about $85,000.

Directors of the Boston Elevated Company have declared the regular semi-annual dividend of 2½ per cent. on the stock, payable August 15.

Officials of the Union Traction Company of Philadelphia say that the July gross earnings have increased about $2,300 daily. The daily average for June was nearly $3,000.

The directors of the Hartford (Conn.) Electric Light Company have declared a semi annual dividend of 3½ per cent. This raises the rate of dividend from 6 to 7 per cent. per year.

The New England Telephone & Telegraph Company has declared the regular quarterly dividend of 1½ per cent., payable August 15. Books will be closed from August 1 to August 14 inclusive.

A mortgage for $500,000 was recently filed in the Somerset (N. J.) County Clerk's office. It was given by the Plainfield Gas & Electric Light Company to the Morton Trust Company of New York.

Advices from London, England, state that Charles T. Yerkes and P. A. B. Widener are there on the invitation of the capitalists owning the underground railways to discuss consolidation plans.

The Westinghouse Electric & Manufacturing Company has declared a quarterly dividend of 1½ per cent. on its assenting stock, payable August 15. Books close (to day) August 1 and reopen August 16.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 16@18; New York Electric Vehicle Transportation, 7@8; New England Transportation, 4@4½; Gramophone, 35@40.

The General Electric Company has filed a certificate of the increase of its capital stock from $20,827,200 to $25,242,200. The debts and liabilities of the company are put down as $6,889,400. Over $25,000 was paid to the State of New York as a tax.

The Massachusetts Board of Gas and Electric Light Commissioners have authorized the issue of 1,000 shares of new stock (par $100) by the Lowell Electric Light Corporation, to be offered to the stockholders at par, in proportion to their present holdings.

The gross earnings of the Brooklyn Rapid Transit Company system for the year ended July 1 were, in round figures, $11,200,000. The largest June earnings the company has ever had were month before last, when they were within a few thousand dollars of being $1,100,000.

The Philadelphia Electric Company will call an assessment from stockholders of $1.25 a share, payable November 21, and $1.25 a share, payable January 21, 1901. These assessments will raise $2,500,000 cash, a considerable proportion of which will be used for construction purposes.

The North Hudson County Railway Company, the Paterson Railway Company and the Jersey City, Paterson & Hoboken Street Railway Company report for the first twenty-two days of July: Gross earnings, $131,127, against $117,079 in the corresponding period last year, an increase of $14,048. The daily average increase was $638 54

The Railroad Commissioners of Massachusetts have authorized the West End Street Railway Company of Boston to transfer to the Boston Elevated Railway Company $73,754, being the proceeds remaining unexpended from an issue of $600,000 bonds made necessary for the payment of certain permanent additions, alterations and improvements made during the fiscal years ending September 30, 1898, and September 30, 1899.

The board of directors of the Safety Car Heating & Lighting Company has elected William A. Reed, of Vermilye & Co., to fill the vacancy in the board caused by the death of Percival Knauth. The board of this company now consists of the following: Robert Andrews, George F. Baker, Jr., William Barbour, E. J. Berwind, George R. Blanchard, Edwin M. Bulkley, S. M. Dodd, A. B. Hepburn, W. H. Kimball, Gen. Austin Lathrop, Edward Lauterbach, William A. Reed, Thomas C. Platt, A. W. Soper and Dr. Peter B. Wyckoff.

Stockholders of the Chicago Union Traction Company held their first annual meeting recently. Out of a total capital of 320,000 shares there were represented at the meeting 243,673 shares. The old board of directors was re-elected as follows: Jesse Spalding, John M. Roach, R. A. C. Smith, Walter H. Wilson, H. B. Hollins, Charles L. Hutchinson, James H. Eckles, C. K. G. Billings, P. A. B. Widener, William Dickinson and John V. Clarke. The company's statement showed only a nominal surplus after the payment of the dividend on the preferred. Common held its own.

The Boston "News Bureau" says: "The stock of the New England Electric Vehicle Transportation Company has recently advanced from $3 to $5 per share, but at this price the stock is selling for less than the actual amount of cash per share in the company's treasury. The New England Company is having a very satisfactory business, but pending the enlargement of its main station—the old Cyclorama Building—the company has not added to its equipment. It has now about 260 vehicles in service, nearly all of which are leased by the month. It has recently leased ten of its vehicles to the Armstrong Transfer Company for use between the Union stations."

James Lewis & Sons, of Liverpool, in their copper circular, state that for the first six months of this year the consumption of copper has increased 30,396 tons, or 44½ per cent. over that of last year. With stocks smaller and less copper available in this country it is quite likely there will be some sharp bidding in the European market for supplies. Domestic production and importations have been larger in this country to the extent of 16,248 tons during the past six months, but as the exports have increased 35,715 tons the balance for home consumption has decreased to the extent of 19,467 tons, as compared with the corresponding period of last year.

At a special meeting on Monday of Massachusetts Electric Company stockholders it was voted to purchase the Lowell & Suburban Railroad and to ratify the purchase of the South Shore & Boston Railway. The basis of exchange of shares of the Lowell & Suburban was two shares preferred and 1½ common of the Massachusetts Electric Company's stock for one share of the Lowell & Suburban Railroad. The basis of exchange of the South Shore & Boston was one share preferred and three quarter of a share of common of Massachusetts Electric for each share of South Shore & Boston. It was also voted to pay the semi annual dividends in January and July instead of in June and December as at present.

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ELECTRICITY.

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EDITORIAL NOTES.

An American Street Railway Financier in London.

Mr. Charles T. Yerkes, the well-known street railway financier, following in the footsteps of Mr. Tom Johnston, another well-known dabbler in trolley roads, is in London for the purpose, so it is alleged, of doing with the underground roads of the English metropolis what he so skillfully did with the majority of the surface roads of Chicago, namely, form them into one system. A recent cable dispatch to the N. Y. "Herald," states that London is really the only big field open to Mr. Yerkes just now. He attempted a year ago to obtain a controlling interest in the Metropolitan District Underground Railway of London, but his ideas were a little too large for the conservative English capitalists to grasp all at once. Now that they have had time to think about it the Englishmen have invited Mr. Yerkes there to talk it over. Naturally the erstwhile street railway king of Chicago does not care to have the exact nature of his business in London spread far and wide throughout England and this country, and therefore in an interview with the writer of the cable dispatch already referred to he says:

"I came to London simply on the invitation of capitalists here who own the charter of the underground railway. They wished to consult me. While it is not unlikely that I shall invest something in their interest, I have not come here with any plan to revolutionize the transportation system of the city.

"I do not come at the head of any syndicate nor with any project. I am past that stage of my career."

He then goes on to refer to the inadequate transportation facilities of London as follows:

"London is certainly in crying need of modern traction facilities. I am unprepared to say whether or not it is a practicable place for electric lines. London's streets are congested, but there is no street in London as badly crowded as Broadway once was. I have seen Broadway so crowded that it took me twenty minutes to go from Wall to Cortlandt street. The street cars have taken the cabs and omnibuses off the streets of New York, the latter almost entirely, the former in great measure.

"When I look at the Strand in London cannot help thinking what its condition would be were the omnibuses and cabs eliminated.

"In London, from what I have observed in the years I have been coming here, there seems to me to be a good system of underground railways connecting with the surface roads in the outskirts. I would not only give the metropolis splendid intramural facilities, but also give the laboring classes an opportunity to get away from the densely populated parts into the healthy, uncrowded localities."

The road, regarding which Mr. Yerkes' advice is being sought, is that of the Metropolitan District Railway, which comprises some thirteen miles of underground track, tapping the most populous sections of London. There are also several shorter lines, operated or about to be operated by electricity.

That the British capitalists have made an excellent choice in selecting Mr. Yerkes as their adviser is not to be doubted, for if any one can furnish London with up-to-date transportation facilities he can. Incidentally, it should, possibly be looked upon as a compliment to the street railway men of the United States that England has to seek in this country a railway man to tell it how to operate and manipulate its roads to the best advantage.

* * *

Another Alleged Electrical Cure for Tuberculosis.

For several years past accounts have appeared from time to time in the daily papers of methods of curing cancer and consumption by applications of electric current to the diseased parts. Over two years ago it was announced that a physician of this city by the name of J. Mount Bleyer had discovered a method of revivifying the blood of persons affected with tuberculosis by means of an electric current of high voltage, while only recently the so-called Crötte method of curing consumption was given a thorough trial at one of the leading New York hospitals.

In a word, the Bleyer treatment consisted in placing a pad on the patient's chest directly over the diseased portion of the lung and a pad on the corresponding point on the back. A current of electricity at extremely high voltage was then sent directly through the body for twenty minutes or half an hour. This operation frequently repeated was supposed, as already stated, to revivify the blood by giving it ozone.

The Crötte method differs somewhat from

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that of Bleyer in that a powerful antiseptic was forced through the lungs of the invalid by means of static electricity.

Another electrical cure of this nature is now being tried with alleged excellent results by Dr. C. C. Carroll of New York. The latter, as nearly as can be ascertained, employs a Tesla oscillator and by passing currents of high frequency and high voltage through the lungs of a patient, in time causes the tubercular matter to be eliminated from the system by the emunctories. As will be seen, the Carroll treatment differs radically from that of Crótte and to a certain extent from that tried by Bleyer, although that of Carroll undoubtedly tends to revivify the blood, which was the principal claim made by Bleyer.

Most optimistic views are expressed regarding the Carroll system, the claim being made that by this treatment even patients in the last stages may be benefited if not entirely cured. It is to be hoped for the benefit of mankind that such is the case, but in the light of other experiments of this nature it is to be feared that those interested in the discovery may possibly be too optimistic. That an electric current suitably applied in a case of tuberculosis in its early stages will prove beneficial has been proven, but that it can be made to cure a patient that has but a few weeks to live is hardly to be expected in the present state of the art.

* * *

A Scheme for Telephoning Without Wires.

A Philadelphia inventor, working along the lines suggested by Nikola Tesla some time ago, has succeeded, according to reports, in devising a system of wireless telephony in which the sounds are transmitted from one point to another through the earth by means of so-called terrestrial currents.

Ever since wireless telegraphy has become a fact, inventors not only in this country, but all over the civilized world have been endeavoring to devise a practical scheme for telephoning without wires. Most of the devices suggested have proved impracticable owing to the fact that it has been found well nigh impossible to transmit a wave through the ether without the agency of a relay or contact breaker of a sparking coil, which devices, as is well known, are too ponderous and inert to convey the rapid pulsations of a telephonic message.

The Philadelphia inventor, Prof. A. Frederick Collins, abstained from trying to transmit telephonic vibrations through space and applied himself to experimenting along a more original line, namely that of sending the rapid vibrations of speech through the earth. Referring to this subject he is recently reported as saying:

"In the first place it should be said that while the earth is a poor conductor of electricity the currents projected through it meet with no such resistance as the ether waves utilized by Marconi. The network of telephone, telegraph and electric light wires, trolley wires, tall steel skeleton structures, and the hundred and one obstacles that divert and disrupt air currents are not encountered under ground. Again, some strata of earth are pretty good conductors of electricity, while others are non-conductors. Thus, it is possible to project two currents, say at different depths, and to secure perfect insulation.

"Now, as to syntony, or electric tuning, a term the layman does not understand usually, let me explain. In listening to a phonograph, say, one may distinguish the notes of a certain instrument in a band if he tries to. He simply attunes his ear and his mind to the vibrations produced by that one instrument. So also in wireless telephony. Everybody understands how a tuning fork will respond, that is will sound to a certain note struck on the piano. A scientist, would say it vibrated when something with the same rate of vibration was set in motion.

"Electric tuning is analogous. A given receiver properly tuned will respond to a certain number of ether or air vibrations per second. So it will to terrestrial vibrations, but it will remain unaffected by another rate of vibrations. Thus, any number of ether or terrestrial waves vibrating at different rates would not interfere with one another, nor would any set of vibrations affect any receiver, except the one specially attuned to its rate.

"Now, we take an ordinary Bell receiver and pick up the vibrations set loose at a distant point with no connecting media save mother earth. Each instrument (transmitter and receiver) is connected by wire with two copper plates, or, rather a copper coil and a copper plate proper. The plate is buried in the earth at varying distances from a foot to thirty feet. The copper coil is encased in the cabinet. The sounds—that is, the vibrations—are transmitted over the wire to the sunken plate, thence through the earth to the corresponding plate buried at the receiving point connected with the receiving instrument. Of course, it will be understood that there are batteries attached to the cabinets, and a Crookes tube as well."

Prof. Collins is said to be at work on a system of electrical resonance by means of which any number of subscribers may be able to converse without interfering with one another. This he hopes to accomplish by a system of like resistances. In other words, to call up a given subscriber, the ohmic resistance of the instrument of the person calling will have to be made equal to the electrical resistance of the instrument with which connection is desired.

Out of door tests have been made with Prof. Collins' apparatus with success, so it is claimed. As yet the system is in a somewhat crude state, but the principle on which it is based has been verified, and larger instruments will be built and tried in the near future. These experiments will be watched with interest by the technical fraternity.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

We are in receipt of the 1900 edition of "Municipalities vs. Private Corporations," by M. J. Francisco. This work, which has been brought thoroughly up-to-date, contains tables showing cost of lights furnished by private companies and municipal plants throughout the country, a list of municipal plants sold or abandoned, experience of municipalities and much other information of value. The author handles this subject of municipal ownership as it should be handled — without gloves, and states facts that will tend to throw advocates of municipal ownership into a state of nervous prostration.

A new writing and picture telegraph, the invention of a Mr. Foster Ritchie, is described in a general way by the London "Electrician." The device is said to differ from the majority of other picture telegraphs in the rapidity with which the sketch or message is transmitted, the pen on the receiving instrument moving as fast as an ordinary writer moves the pencil of the sending instrument. No skilled operator is required, and the transmitting pencil is moved by the writer of the message. "We tested the instrument ourselves," adds our contemporary, "and found that, although the handwriting may be slightly distorted, its character is not changed, and a diagram sketched was faithfully reproduced. The instrument is so arranged that no impression is made on the receiving instrument when the pen is moved above the paper, a contact being made by the pressure of the pencil. The instrument will work on an ordinary metallic circuit line." From the above somewhat meagre information we should judge this alleged new invention is similar to the telautograph brought out by Prof. Elisha Gray some years ago.

It is stated that the Manhattan Railway Company of this city will be running experimental trains by the third rail system on part of the Second Avenue line before Oct. 1. The power will be obtained from the Metropolitan Street Railway Company.

If reports are to be credited, wireless telegraphy will shortly be made use of in the land of the flying fishes, as a body of troops recently arrived at Tien-Tsin is reported to have taken out from England a number of Marconi instruments.

Mr. A. A. Knudson, the well-known electrolysis expert, recently made an exhaustive examination of the water mains of Providence, R. I., with a view to ascertaining to what extent they were being affected by electrolytic action. In a lengthy report submitted, Mr. Knudson finds that the principal cause of the escape of the electricity from the trolley rails is in the defective bonding of the rail joints. This permits the return current to shoot into the ground, and seeking another conductor get into the water pipes. While Mr. Knudson thinks it is not within his province to specify methods to be used by the railway company to control their currents better, he recommends that attention be called to the necessity of early action to correct the excessive escape of current. Not only should the bonds be replaced, but the frogs and switches at all other turnouts should be tested and those found defective promptly renewed.

Experimental work has been going on for some time at Milwaukee, Wis., on a submarine boat of the Raddatz type, and those conducting it seem to be pleased with the results. The boat is about 65 feet long and 4 feet diameter in the middle, tapering to a point at the ends, and is of the typical cigar shape. At the top of the boat are two conning-towers 20 inches in diameter. When cruising on the surface the boat is driven by an oil engine of about ten horse-power, which is capable of giving the vessel a speed of from six to seven miles an hour. When submerged the boat is driven by an electric motor fed from sixty-two cells of storage battery, and giving power to produce a speed of four to four and a half miles an hour. The boat can sink in from thirty to forty seconds, and reaches a depth of 40 feet below the surface. The ascent is made just as

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quickly. It is claimed that three men could remain below the surface eight hours, and two men at least twelve hours without any inconvenience: this in the small experimental boat. The boat carries its own supply of compressed air.

It is stated in Washington, D. C., that in accordance with an agreement reached by the Powers, the Eastern Extension Cable Company is laying a cable connecting Taku, Port Arthur, Chefoo and Shanghai. The cable is to be ready for service as soon as possible, certainly before the Gulf of Pechili freezes over. Should hostilities continue during the winter, the telegraph line between Chefoo and Shanghai would probably be cut. Land communication between Port Arthur and Siberia would be impossible, and without this new cable the allied troops would be as effectively cut off from communication with Europe and America as the ministers are at Pekin. Officials figure the cost of the cable at about $1,000 a mile or a total of $900,000 for the line. It is understood that the several Powers taking part in the restoration of peace and order in China will pay an equal share of the cost, about $125,000 apiece.

An automobile club is about to be organized in Westchester County, N. Y., by Howard Willets, Paul G. Thebaud and others.

The cable steamer Silverton, engaged in laying the cable for the Commercial Cable Company from Canso to New York, completed the work last month, and the cable is now being used by the company for the transmission of messages. This makes the fourth cable now operated by this company from New York to Canso, three from Canso to Waterville, Ireland, and one from Canso to the Azores and thence to Germany. As all of these cables are working duplex, it is practically the same as eight single wires.

Work has been begun on a new power house for an electric plant on William K. Vanderbilt's Idle Hour estate at Oakdale, L. I. The building is to be of brick, with limestone trimmings, and inside it will be finished with enameled brick and will be large enough to contain four boilers and the other machinery necessary to the plant. The wires will run to the new residence in an underground conduit.

The Pennsylvania Railroad Company will shortly begin the work of introducing the electro-pneumatic signal system between Philadelphia and Rosemont on the main line. For some years the officials of the company have been quietly substituting the automatic signaling system for the regular block system. It will take some time to put this system in operation, as ten miles of the road, embracing over forty miles of track, will have to be connected. It is the intention of the company to eventually have all its system equipped with electro-pneumatic signals.

An auxiliary step for electric cars has been brought out by the inventor, S. B. Fuller of Pawtucket, R. I. When not in use it is turned up out of the way. There is a separate step for each row of seats, and all are controlled from any part of the car. A continuous shaft is attached to the under side of the stationary step. The movable step is held loose on the shaft, which has sprocket wheels connected by chains with sprockets on the under sides of both end platforms. Arms on the sprockets are operated by foot pressure to bring the steps upright, and a spring turns the shaft back when the foot is removed from the end of the rod. All the steps have the same arrangements, and one or all can be let down, and when raised are caught by a bolt. A pair of electric magnets back of a bar on the end of the bolt draw it out when the magnets are energized and let the step down. Current is turned on and off the magnets by a push button at the end of the seat, and when the circuit is closed the magnets draw the bolt and permit the step to drop for the convenience of the stout passenger. The conductor is able to press a button and let down steps on either side of the car, and the steps are turned up by the movement of the foot rod. The letting down of a step indicates to the approaching passenger where there is a seat, and a bell rings continuously while the step is down so that the conductor is not liable to forget to turn it back, and thus lessen the chances of collision with teams.

U. S. Consul Hughes at Coburg informs the State Department that the work of laying the new German-American cable from Emden to New York is now proceeding. By the end of the summer it is expected that the entire 4,984 miles of wire will have been laid, so that the new cable may be formally opened in October. The section from Emden to Berkum Island is laid partly on land, but from there to New York it is an all sea line. The cable will cost about $4,866,500.

The local postoffice officials at Washington, D. C., are much pleased with the work of the automobile mail wagons which have been given their first trials in that city. Big savings were effected in the collection and the delivery of mail. The manufacturers say that there will be considerable economy in the operation of the machines. If that can be demonstrated it is probable that they will be rented by the local postoffice. The wagons are enclosed at the front with glass windows, and the carrier occupies a stool on a small platform at the rear. There the electric machinery is at hand and through the glass windows he sees to guide the wagon. The carrier can step off at every letter box without the loss of much time. A large electric automobile has also been used in transferring mails in quantities to the sub-postoffices.

The street car magnates of Chicago are going to cut fares to three cents whenever the auto-bus competition gets sharp enough to make serious inroads in their business. The first electric bus line was put into operation in that city last week. This week will see the installation of another, with nine vehicles, to run from Lincoln Park and later from Garfield Park to the business district and to the railway stations. These vehicles are propelled by storage batteries, and can accommodate twenty passengers. The fare for a ride one way is five cents.

A patent has been secured by an inventor in England for converting floor dust, house or other refuse into fuel, for burning in either open fire grates, marine, railway, or other furnaces, as a substitute for coal by mixing it with charcoal, (either animal or vegetable) oil, or other caloric and inflammable substances. The cinders, dust, etc., are first pulverized or ground to atoms, mixed with proper proportions of charcoal, oil, etc,, until of the consistency of paste, then placed in moulds of any desired shape or size and pressed into solid blocks, which are then air or kiln dried and ready for use. Those intended for open grates are made more inflammable, so as to burn up quicker and brighter than those meant for use as slow combustion fuel, or in furnaces where a forced draught is obtainable. The inventor has named this fuel "Pyrojim," and claims that it will burn thoroughly with very little ash and hardly any smoke; will not only be cheaper than coal, but give much greater heat than the best coal, and take up about half the storage space, the latter feature making it particularly valuable for use in steamships.

In the parish of Runwell, Essex, England, an apparatus ha been erected lately by the rector for ringing the church bells by electricity. The origin of the invention is rather curious. The rector, finding a difficulty in obtaining bell-ringers, rung the bells for three months himself. In order to save the labor involved in performing this task, he invented the "automatic ringer," and erected the apparatus in the church tower. By connecting the machine with the electric current already in use for lighting the church and rectory, he succeeded in ringing the bells with perfect order and precision. The invention is in all respects an absolute success.

It is reported that the London Underground Electric Railroad, opened last week, has been a tremendous success, so far 80,000 people having used it daily.

The Postoffice Department has opened negotiations with the North Jersey Street Railway Company, and the Jersey City, Hoboken & Paterson Street Railway Company for the use of trolley lines for mail-carrying purposes. The mail-wagon service will expire July 1 next. It is also proposed to deliver mail from the Jersey City office to Hoboken, Secaucus, Rutherford, Carlstadt, Passaic and Paterson, N. J., by trolley cars.

There is soon to be put into practical use in Richmond, Va., a new device in the way of an electrical invention, which will prove of general benefit. This little machine is known as the Avon meter—a device for measuring electricity, as gas is now measured, and with as much if not more accuracy. This machine is manufactured in London, Eng., and so far not one has been sold in America, having been only used here in a test which was recently made in New York City, in which the machine proved its worth and accuracy. An official test of the Avon meter will be made in Richmond on the first of next October, by the Richmond Passenger and Power Company, and if success is proven, then it will be put into general use in that city. The indications are that the machine will be universally adopted, as the need of it has long been felt, and it will in a short time become as common in use, as the gas meter.

Mrs. Ira E. Tutt of Long Beach, Cal., runs an electric plant that lights Long Beach, Terminal Island and San Pedro. The plant is in every way up-to-date. Mrs. Tutt is an expert in machinery. She selected the proper grounds and directed all the details from first to last, even to putting up the poles and wires.

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INTERNATIONAL ELECTRIC COMPANY'S EXHIBIT AT PARIS.

BY FRANK C. PERKINS.

Mr. Henri Pieper is the general director and the founder of the International Electric Company of Liege, Belgium, which started in 1819 from small beginnings and has developed into one of the most important electrical works of Europe with branch factories in Russia and France and agencies in other countries.

Through the increase of the business it was found necessary to reorganize the company and Mr. G. J. Melms of the United States was

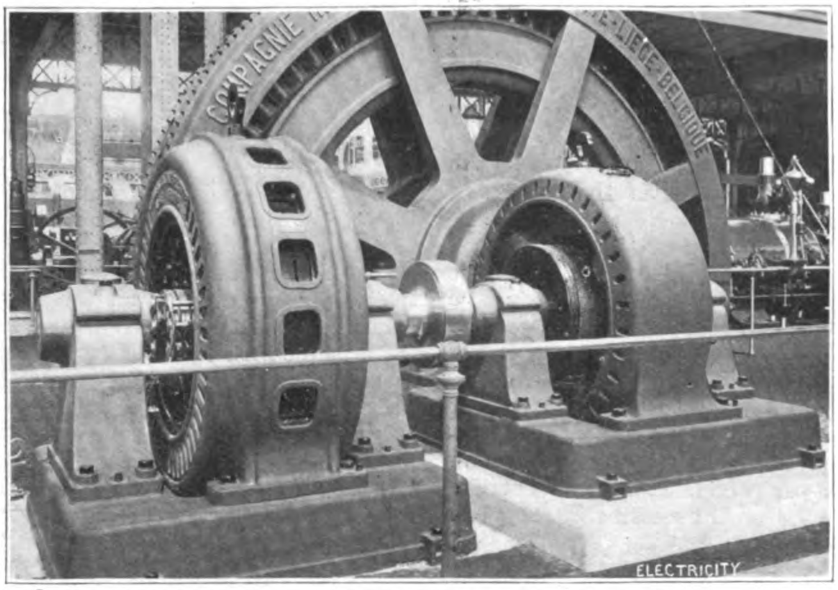

Fig. 1.—1,000 K.W. 3-Phase Generator and Transformer.

called into the firm as manager and technical director.

Mr. Melms has held several important positions in the Thomson-Houston Company also in the General Electric Company and was from 1884 to 1890 manager of Messrs. Brown, Bovery & Co., of Frankfurt, Germany.

Under the charge of Mr. Melms the Frankfurt municipal electric station, one of the largest central power stations in Europe, was constructed and operated.

The exhibit of this company at the Paris Exposition is one of the most interesting, and consists of electric hoisting machinery, continuous current and polyphase current dynamos. The largest generator exhibit by this firm is of the three-phase type of 1,000 kilowatts capacity operating at a potential of 2,200 volts. This machine is partially to be seen in the accompanying illustration, Fig. 1. It is direct connected to a steam engine of Belgian manufacture which operates at 83 revolutions per minute. This alternator has 72 poles in the field magnet and the frequency at the above mentioned speed is 50 cycles per second. This three-phase machine is utilized in the regular service of the Exposition and has an efficiency of 94 per cent. The exciter used is a direct current dynamo of 23 kilowatts capacity and operates at 110 volts potentially.

A second three-phase generator exhibited by the International Electric Company has a capacity of 80 kilowatts and operates at a tension of 530 volts. The speed of this machine is 600 revolutions per minute, the frequency also being 50 cycles per second. The efficiency of this generator is 90 per cent., the exciter being a direct current machine generating 20 amperes at 20 volts. The exhibit of direct current machines of this firm as well as transformer and switchboard apparatus is very satisfactory and interesting. The main switchboard showing the switches, meters, and general construction may be seen in Fig. 2, while the electric cranes and other hoisting machinery is particularly interesting.

THE PREVENTION OF SCALE AND CORROSION IN BOILERS.*

BY R. D. SUMMERFIELD.

Although this question is one on which very much has been and is being written by many of the foremost engineers in the country, the author feels that no apology is needed for reiteration on this subject, both on account of its importance and of the fact that even now the majority of steam users appear to be either ignorant or careless of the proper treatment of feed water in order to prevent scale and corrosion in their boilers.

Before putting down any boiler the nature of the proposed feed water should be taken into consideration, and several samples of it ought to be sent to a competent chemist for analysis, so that before the boiler is put to work arrangements can be made for purifying the water in accordance with the results of the analysis.

The indiscriminate use of the nostrums advertised for purifying feed water will in most cases lead to disappointment, as although they may each be of use for some particular kind of water, yet in any other water they would probably do more harm than good, removing the scale, perhaps only to corrode and pit the plates.

There are, however, several makers of patent boiler fluids who analyze the feed water first and then supply a preparation to suit it, but as the use of soda in the proper manner and proportion will bring about the same result much more cheaply, the use of any patent fluid is quite unnecessary.

Apart from these patent preparations, the number of different substances which have been put into boilers with the object of preventing or getting rid of scale is almost incredible. Paraffin, soft soap, tallow, oak bark, elm bark, nutgalls, sugar, molasses, starch, soda, potash, lime, linseed, carcasses of animals, potatoes, spoilt flitches of bacon, logwood chips, sawdust, muriate of ammonia, or sal ammoniac, washing over with Portland cement, or with blacklead and paraffin, Irish moss, chloride of tin, etc., are some of them, and many of these are used regularly at the present day.

The impurities of feed water are of two kinds—those held in suspension and those held in solution. The former consists of particles of clay, earthy matter, sewage, refuse from towns, etc., disturbed by the water in its passage, and may be gotten rid of by allowing the water to remain quiet for some time, when the impurities held in suspension will fall to the bottom as fine mud.

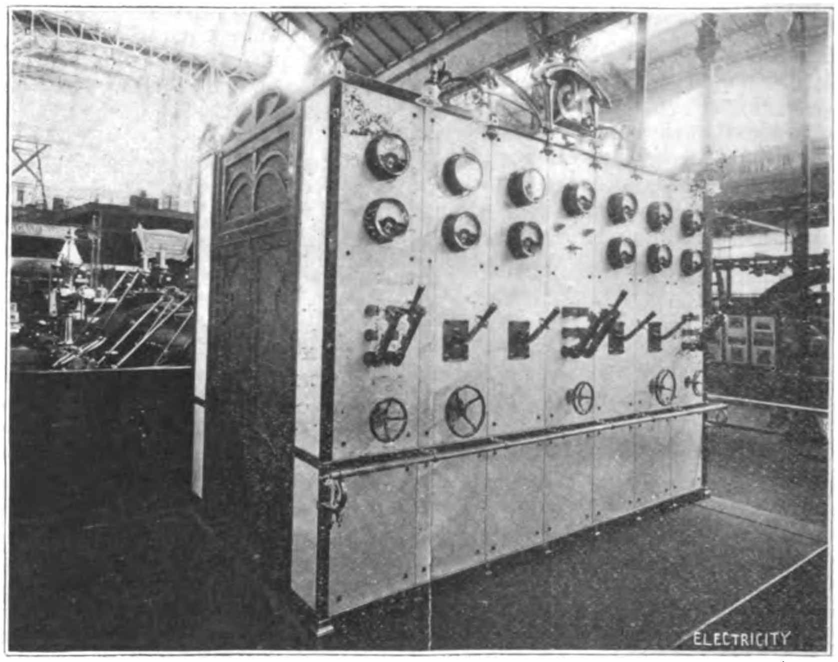

Fig. 2.—Main Switchboard of International Electric Company's Exhibit at Paris.

The impurities held in solution in most waters drawn from rivers, canals, lakes or wells consist principally of sulphate of lime, bicarbonate of lime, and carbonate of magnesia, and analysis may also show traces of silica, salts of iron, sulphate of potash, chloride of magnesia, nitrate of calcium, and various acids, but the three first named, especially the

* From the "Electrical Engineer," London.

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sulphates and bicarbonates of lime, are nearly always present in quantities out of all proportion to the remaining impurities.

Carbonate of lime, the principal constituent of selenite, chalk, marble and limestone, is held in solution in fresh water by an excess of carbonic acid, and is really present in the form of a bicarbonate. In order to precipitate this, the excess of carbonic acid must be gotten rid of, and this can be done either by heating the water or by employing a re-agent. The solubility of the bicarbonate diminishes with an increase in temperature, becoming nil at a temperature of about 290 degs. F., corresponding to a gauge pressure of about 45 lbs. per square inch. At the ordinary pressures of 80 lbs. to 150 lbs., it is rapidly precipitated in boilers or feed heaters.

The precipitation may also be caused by introducing caustic lime or caustic soda into the water, as these substances take up the excess of carbonic acid and set free the carbonate of lime, which falls to the bottom as a white powder and settles in the quietest parts of the boiler, where the circulation is worst, remaining for some time as soft sludge or mud, but if not blown or washed out it cakes into a hard mass, which has to be chipped off.

In the lime process, such as Clark's or Archbutt and Deely's, about half a grain of caustic lime is added per gallon for each grain of bicarbonate, which causes a precipitation of nearly twice the weight of the caustic lime introduced, but this process requires for its successful application large settling tanks, containing not less than six or seven hours' water supply, besides other plant, so that the first cost is high and a good deal of space is required. These objections are often sufficient to prohibit the adoption of this system of purification.

In the caustic soda process the precipitation may be carried out in the boiler, only one small tank being required in which to mix the soda with the feed water. The proportion per 1,000 gallons is 1½ oz. of pure caustic soda for each grain of lime per gallon; for instance, a water containing 10 grains of bicarbonate per gallon would require $10 \times 1\frac{1}{2} = 15$ oz. of caustic soda for each 1,000 gallons. Carbonate of lime is soluble in 62,500 parts of pure water at freezing point.

Sulphate of lime, which is the same as gypsum or plaster of paris, is also insoluble in water at a temperature of about 300 deg. F., its greatest solubility being at 95 deg. F., when it dissolves in 393 times its weight of water. At freezing point it is soluble in 500 parts of pure water, and at boiling point in 460 parts. If allowed to settle on the plates the sulphate soon forms a hard scale, sometimes as hard as stone, which causes great danger of overheating, and great loss of fuel, about 10 per cent. more fuel being required with scale $\frac{1}{16}$ in. thick, and double the quantity of fuel when the scale is ½ in. thick.

The sulphate may be precipitated in the same way as the carbonate by heating the water to a temperature of about 300 deg. F., corresponding to a gauge pressure of 50 lbs. per square inch, or it may be precipitated by the addition of pure carbonate of soda, in the proportion of 1¾ oz. of soda per 1,000 gallons of water used for every grain of sulphate of lime per gallon found in the water. Thus, if a water were found on analysis to contain five grains of sulphate per gallon, then $5 \times 1\frac{3}{4} = 8\frac{3}{4}$ ounces of carbonate of soda would be required for each 1,000 gallons of water used, but care should be taken that the carbonate of soda, and also the caustic soda used [for carbonate of lime water, are as pure as can be obtained, or foreign substances may be introduced into the water, which may bring about chemical changes by no means to be desired.

Carbonate of magnesia, or magnesian limestone, forms scale in the same manner as carbonate of lime. It is soluble in 5,532 parts of pure water at 32 deg. F., in 9,623 parts of water at 212 deg. F., and insoluble at the same temperature as carbonate or sulphate of lime. It may be precipitated by the use of carbonate of soda in about the same proportion as for carbonate of lime, but the best way to get rid of it is to heat the feed water before entering the boiler. In brackish water chloride of magnesia may be present, and when concentrated this decomposes at 212 deg. F., forming magnesia and hydrochloric acid, which latter, on being set free, rapidly corrodes the iron.

This brings us to the question of acid waters, which are as dangerous, although not so common, as scale forming waters. Besides the hydrochloric acid, which is formed as mentioned above, water may contain tannic acid, produced by the decomposition in the water of the bark, leaves, or wood of various trees, such as oak, hemlock, logwood, etc., acetic acid., formed by chemical changes from sugar or other sweet substances, carbonic acid, produced in putrid waters, or waters turning putrid, and various other acids, which all, however, show their presence by pitting or corroding the iron plates and other parts of the boiler more or less rapidly. Acid waters should be treated by the addition of an alkali in order to neutralize the acid. The best alkali to use is pure carbonate of soda, which should be added in the proportion of one grain of soda per gallon for each degree of acidity in the water. The soda should be mixed with the feed water in a separate vessel before it enters the boiler, as it often causes foaming when introduced into the boiler itself.

Although the chief danger to a boiler from the presence of oil or grease is overheating and foaming, yet substances of this description are also indirectly the cause of scale and corrosion, and great care should be taken to prevent them entering the boiler. The grease or oil floats on the surface of the water and mixes with the carbonate of lime, which, when it is present, often floats on the surface also as a loose powder before it falls to the bottom. The mixture of oil and lime forms a sticky paste, which adheres to the hot parts of the boiler so closely that blowing out two or three times a day will not move it, and in time it becomes a dangerous scale. Then the grease may decompose and form acid, as mentioned before.

Feed water drawn from the hot-well of a condensing engine is always more or less greasy, and should be passed through a good oil-filter before entering the boiler, but as grease or oil may enter from other sources—from the boiler fittings for instance—a scum trough should be fixed in the boiler, and this should be blown out every time the bottom blow-off cock is opened, say three times a day. Blowing out is a most important point in the prevention of scale. It should be done at regular intervals several times a day when the boiler is working, no matter whether the water has been chemically treated before it enters the boiler or not. The great point, however, is to prevent the scale-forming substances from entering the boiler at all, so that it may contain nothing but sweet and pure water, and practically the only way to bring this about is to employ some form of feed-water heater.

The proper way then to treat feed water containing sulphate or bicarbonate of lime or carbonate of magnesia is first to dissolve in it pure soda in the proportion mentioned above, and after that to pass it through a vessel in which it is heated to a temperature of about 300 deg. F. before entering the boiler.

The design of an efficient feed heater is not a simple matter by any means. Numbers have been tried, and quantities of patents are still taken out in connection with them, but the best are a long way from engineering perfection. The principal points to be considered in a heater are that the water must not pass through too quickly, in order that the impurities may have time to be precipitated. For this reason also the heating surface must be as large as possible; the heater must be strong enough to stand the full boiler pressure; it must be simple, not liable to get out of order, easily gotten at, and easily cleaned out, which last is the most important point about it, as its efficiency depends on the cleanliness of the collecting surfaces, and if these are difficult to get at, the cleaning will surely be shirked by the boiler attendant, with the result that the water, not being able to deposit all its impurities in the heater, owing to the thick deposit of scale already there, carries the remainder into the boiler.

In the author's opinion the question of cleaning should receive more consideration than any other in the design of a feed heater; he would suggest that the shell of the heater be a plain cylindrical drum having a cover bolted to each end, the drum to be of sufficient diameter for a man to work in, and to be placed across the main flue in such a position that both covers might be easily taken off for cleaning. The feed water, after passing through a tank in which a proper proportion of soda has been dissolved, should enter at the circumference of the drum, and pass over to the surface of the outer shell, afterwards passing over inner surfaces, and finally being taken away to the boilers from the center of the heater. The internal part, consisting of baffle-plates and water passages or tubes, should be made to slide easily into the drum, so that it might be withdrawn bodily for cleaning, and a duplicate internal part should be provided, which could be slipped into the drum as soon as this had been scraped out. This would greatly lessen the time during which the heater would be out of action, and would ensure the thorough cleaning of the part taken out, as the manager would be always able to see it before it went into the heater again. It is important that the cleaning should take place at regular intervals, depending on the quality of the feed water. With some waters the heater might require cleaning out every three or four days, while with others a monthly or bi-monthly cleaning would suffice; the quality of the feed will also determine the amount of water which must be blown out of the heater every day through the blow-off cock, generally a quantity equal to the contents of the heater should be blown out every six hours.

In the author's opinion a suitable feed-water heater and purifier is as necessary to a boiler as the firegrate, and when steam users generally begin to realize the enormous saving in the coal bill which is effected by a boiler always clean and free from scale, no doubt feed heaters will be considered indispensable.

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At present there is no heater on the market which can be said to have stood the test of time satisfactorily, and many persons have even discontinued the use of them after a time, principally owing to the difficulty of keeping them properly clean. This question of cleaning is of the utmost importance, as mentioned before, but it is a point which inventors often miss, and in fact one which is frequently missed by buyers as long as the apparatus gives good results when new.

This refers to boilers quite as much as to feed water heaters. For instance, during the last few years a number of water-tube boilers have been brought out with variously curved tubes, and some of these boilers have given wonderfully good results when tested for efficiency: but unless the water supplied to them has been purified, or is naturally pure, the author imagines that this efficiency will soon fall below that of an ordinary Lancashire boiler unless they are kept very clean, the cost of which will probably more than equal any increased gain in evaporative power—in fact, it is probable that a short experience of these kind of boilers will bring out the fact that without a thoroughly efficient feed-water purifier the enormous cost of cleaning the tubes will prohibit their use altogether.

ELECTRICAL MEASURING INSTRUMENTS.*

BY J. FRANKLIN STEVENS.

(Concluded from page 56.)

There is no one line connected with the electrical industry in which so much attention must be paid to details as in the manufacture of electrical indicating instruments. A very prominent engineer remarked to me recently that he had examined the construction and operation of a great many different types of indicating instruments, and, while a number of them bore evidence of similarity in design and construction, yet in some cases the manufacturer seemed to have acquired the "trick" of proportioning, manufacturing and calibrating, while others utterly lacked the "trick." As a matter of fact, it is not altogether a case of acquiring the proper "trick," but is a case of studying the theory and design of instruments for a number of years, backed by a large and varied experimental experience, which marks to-day the difference between the successful and unsuccessful instruments in the various types commercially exploited. Account must be taken of the most petty details of construction, the most careful and skilled labor must be employed in each department, and every particle of material entering into the instrument must be carefully selected and tested with reference to its particular function.

Personally, I have seen the experiment tried of taking a finished and efficient instrument and placing it in the hands of a careful and skilled mechanic for duplication; every wire and every part would be, apparently, an absolute copy of the original, and yet the results obtained would be totally different. It follows, therefore, that it is always wise in placing orders for electrical instruments to select a house who has publicly demonstrated the fact that it has learned the necessary "trick" or "tricks" of its profession.

In no line does reputation count for more than in the manufacture of indicating instruments, nor is there any line in which I have been brought in contact where it takes so long a time to establish a reputation. Further than this, there is no line in which a greater amount of patience is required by the manufacturer. The average purchaser is totally ignorant of the laws or principles embodied in the instrument he is using, and, without regard to the fact that he may have selected the wrong type for the particular class of measurement he wishes to make, unhesitatingly blames the manufacturer for not having known what he wanted and for not having supplied him with the proper type of instrument by pure intuition.

Another obstacle which is commonly met by instrument manufacturers is the fact that for the average installation he is required to furnish instruments delivered to the switchboard contractor, who may or may not handle the instrument properly. It is true that most instruments are sealed, yet it is perfectly possible to utterly ruin the calibration of almost any type of instrument by improper handling without destroying the seal or opening the case. For instance, if a D'Arsonval instrument is laid upon the frame of an actively excited dynamo or motor, its entire calibration will be almost instantly changed, and yet no external evidence is presented to show exactly what has happened. Rough handling and an occasional fall, or improper packing for delivery to the plant, may further operate to destroy the accuracy of the calibrated instrument; yet the manufacturer is expected to provide instruments which will stand such usage and which, after they have been installed, may be subject to the influence of such strong external fields or such high external temperature as to make their correct indications impossible; and, after all of this, must have his instruments accepted or rejected by the consulting or supervising engineer, who, on the day of the test, carefully checks them with his personal portable instruments, which are usually kept in almost ideal condition and seldom or never leave his immediate possession. Some day I trust these conditions may be modified to the extent that the engineer in charge will test and check the instruments, if he doubts the accuracy of the maker's calibration, before the instruments are shipped; or else issue instructions that the switchboard shall be drilled from template and the instruments set in place by the engineer's own assistants. In several cases I have succeeded in having the latter course adopted, with the result of mutual satisfaction on part of the owner, engineer and ourselves.

If arrangements could be made to have all instruments installed under the supervision of the engineer in charge, it would then be quite sufficient to have the specifications state the limit of error allowed in the indications of the voltmeters and ammeters; and this information, coupled with a specification covering the style of case, character of scale, range and class of measurement to be made, would enable the manufacturer to make an intelligent tender for the instruments required in any installation.

While a high degree of accuracy is desirable in all indicating instruments, it is particularly important that the voltmeter should be right within at least 1 per cent., since a variation of 1 per cent. in voltage means a corresponding variation in the candle-power of every incandescent lamp which may be in circuit. It is quite well known that the candle-power of any incandescent lamp varies directly with the voltage, the variation being approximately 1 candle-power for every volt increase or decrease from the normal voltage of the system.

Further than this, a variation of 1 per cent. from normal voltage on a system carrying incandescent lamps means a variation of about 16 per cent. in the life factor of the lamp and about 3 per cent. in the watt consumption per candle-power. Errors in the indications of ammeters do not produce such serious results, yet it is desirable that they should be accurate in order to obviate the danger of overload on circuit, translating device, or generator; and in the case of test instruments, as high a degree of accuracy should be demanded as is required in the voltmeter.

While on the subject of accuracy of indications, I would like to impress upon you the fact that, while we have three electrical units in common use, namely, the volt, ohm and ampere, the ohm and ampere are the only two fundamental units, the volt being a derived unit. The absolute ohm may be quite readily obtained, and, as you probably know, is defined by law as the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross-sectional area, and of the length of 106.3 centimeters. The ampere is likewise defined by law as the practical equivalent of the unvarying current, which, when passed through a solution of nitrate of silver in water in accordance with standard specifications, deposits silver at the rate of .000118 gram per second. The volt is defined as the electromotive force necessary to send 1 ampere through 1 ohm. This, as you will note, gives us fundamental values for the ohm and ampere and defines the volt as a derived unit, and I am laying stress on the matter for the reason that the average electrical writer defines the volt as a fundamental unit equivalent to $\frac{1000}{1434}$ of the potential at the terminals of a standard Clark cell, and then defines the ampere as that current which 1 volt will cause to flow through a resistance of 1 ohm. As a matter of fact, the Clark cell is a secondary standard, exceedingly useful in practice, but not designed for use as a fundamental standard, due to the fact that Clark cells will vary among themselves, and will give a gradually decreasing voltage at their terminals after they have been in service any length of time. It is, further, impossible to take 1 ampere from a single Clark cell without permanently ruining it; and, as a matter of fact, the potential of a Clark cell is only correct when the cell is used on open circuit.

It has been rather difficult for me to understand why the absolute ampere has been so little used or so seldom referred to when it is a unit more readily verified than is possible with the volt. It is true that the fundamental method of determining the ampere is rather slow and tedious, but it is extremely easy to obtain the absolute ampere in c. g. s. units by the use of the tangent galvanometer. Defined in c. g. s. units, the ampere is such a current that, passed through a conducting wire bent into a circle of the radius of 1 centimeter, will attract a unit magnetic pole held at its center with a force of one dyne; and this method applied to the tangent galvanometer gives the very simple formula of current equals galvanometer constant into the tangent of the angle of deflection of the polarized needle, the galvanometer constant being readily determined from its dimensions and the number of turns

* Paper read before the Electrical Section of the Franklin Institute, Philadelphia Pa., April 24, 1900.

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of wire, in connection with a determination of the value of the horizontal component of the earth's magnetism. Having once determined the absolute c. g. s. value of the ampere, we know that the practical ampere is one-tenth the value of the c. g. s. unit. Having obtained the absolute standards of current, expressed in amperes, and resistance, expressed in ohms, the standard volt is readily determined from the relations given in Ohm's law. With the primary units once determined, all others, such as the farad or coulomb, can be readily obtained.

To obtain absolutely correct standards of voltage and current for alternating current calibration it is only necessary to calibrate a dynamometer voltmeter and a dynamometer ammeter in true volts and amperes as determined by fundamental standards; then, as a dynamometer measures directly the square root of the mean square, it will indicate correctly the virtual voltage or current in an alternating circuit. In calculating resistance in alternating current instruments it is necessary to modify Ohm's law to the extent of substituting impedance for resistance. Since impedance is the vector sum of the ohmic inductive resistances, it is readily obtained by triangulation when the two resistances are known, or when one is known and the angle of lag can be ascertained.

While the design, workmanship and material entering into the construction of an instrument are of vital and fundamental importance, the actual calibration is equally important. Assuming the manufacturer has reliable standards of voltage, current and resistance, trained observers are necessary who should be instructed not only to properly mark the scale but to check it, and should also be instructed to carefully test the instrument for errors due to reversal, to lag or hysteresis, and for errors introduced by the presence of external fields, or by the variations of internal or external temperature. Certain definite limits must be set for errors allowed and no instrument permitted to go out until it has fully come up to the standard so set. In the company with which I am associated we not only make all of these tests and check readings, but likewise provide an additional check on the calibration by plotting the calibration curve at the time the scale is made by the draughtsman, and if errors or irregularities are observed in the curve showing a departure from the standard curve applicable to the type of instrument under construction, the instrument is promptly returned to the calibrating room to have its readings checked, or to hunt for and remove the defect which caused the irregularity. It is a known fact that for every type of system there is a characteristic scale, following a more or less complex law, and any variation of the calibration from the normal indicates immediately that there is something wrong, either in the construction of the instrument or of some of the elements entering into it, or else it was inaccurately calibrated. I, personally, attribute a great deal of our commercial success to this intermediate checking in the drawing-room, and you can put it down as a settled fact that any manufacturer who produces instruments of any particular type the scales of which for corresponding ranges vary greatly from one another has not yet mastered the proper design or construction of his instrument.

It would be impossible to detail the many different kinds of measurements which can be made with the proper type of voltmeter, ammeter and wattmeter. In general, however, the possession of these three instruments enables one to measure not only voltage, current and power, but likewise capacity, inductance and resistance; and from these various measurements may be obtained data covering the performances of almost any type of generating or translating device.

There are many special forms of indicating instruments designed to indicate directly some of the various measurements most frequently employed, two of which at least, are so universally used at the present time that they deserve at least passing mention. One is a voltmeter designed for use on constant current arc light circuits, capable of indicating directly the total electromotive force of the dynamo, and so connected by means of self-contained switches that not only can the total voltage of the dynamo or circuit be read, but likewise the presence of a ground indicated and its actual value in volts directly determined. This involves an arrangement of connections so that the voltmeter can be connected directly across the terminals of the circuit and then connected successively from the plus and minus side of line to ground. From the three readings thus obtained the number of lamps burning can be directly ascertained, the presence of the ground shown and the ground itself can be absolutely located by a very simple calculation. By employing in addition to this, the known resistance of the instrument, the actual resistance of the ground in ohms may be obtained, thus defining its character.

An instrument of this character was brought out by my company some few years ago, and has met with almost universal favor, due largely to the growing tendency to measure resistances under full working potential. Such an instrument will show grounds which would not be shown by the ordinary galvanometer and bridge method of testing, and further enables the switchboard attendant to locate grounds while the line is in operative condition.

Another instrument, which for a time fell into disuse, but which to-day is being used more extensively than ever, is the differential voltmeter, designed primarily to show the difference in potential between the bus bars and any dynamo which has to be connected to the bus bars in parallel with dynamos already operating. It is rather a curious fact that the average dynamo tender places implicit confidence in the indications of his differential voltmeter. The mere fact that he can see the pointer come back to zero when the free dynamo is being brought up to voltage, and the knowledge that when the pointer does stand at zero he can throw the free dynamo into circuit without danger of trouble, impresses him with the idea that the instrument is essentially reliable and accurate, and he is ready to condemn any or all of his regular switchboard voltmeters which fail to agree with it in indication. This tendency has led my company to devote special attention to the calibration of differential voltmeters and to furnish them with a full scale which indicates the exact voltage of the bus bars, in place of furnishing instruments which give full scale deflections for 10 per cent. or 20 per cent. of the normal voltage.

In closing I would say that I know of no subject connected with electrical engineering which promises such rich rewards for investigation as the subject of electrical measuring instruments, and if my hasty and very general review of the subject will influence anyone to pursue the subject thoroughly and scientifically, I shall feel more than repaid. I have confined practically my entire time and attention to this line for a number of years and find the subject grows more interesting the further I investigate it, and I hope the time is not far distant when the literature of this subject will be as complete and as comprehensive as that now available in allied branches of electrical engineering.

THE HEMINGWAY-COLEY AUTOMATIC REPLACING FUSE.

This fuse, which is the invention of Mr. R. J. Coley, is designed to provide against the extinction of light frequently caused by momentary short-circuit. This is done by providing two fuses, the second of which automatically comes into action when the first has been blown. The assumption is that the interval between the blow of the first fuse and the

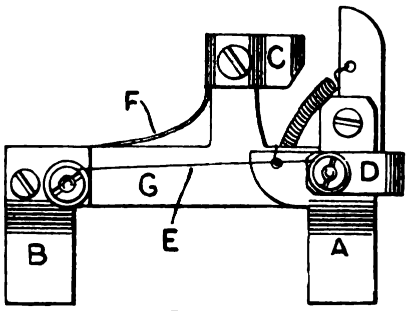

FIG. 1.

switching-in of the next is sufficient under ordinary circumstances for the accidental short-circuit to have ceased to exist. In Fig. 1 the first fuse is in circuit, which connects one fuse block to the movable contact on the right-hand side of the figure. This contact is constrained by a spring, which tends to close the connection to the subsidiary fuse. It is prevented from doing so by the fuse wire, which is in tension. As soon as this fuse wire melts, the revolving contact flies over, and puts the second fuse in circuit. Fig. 2 shows the apparatus as it would be seen after the first fuse has blown. The letters on the diagram mark the following parts: *a* is the subsidiary contact, and *b* is that contact which is common to both

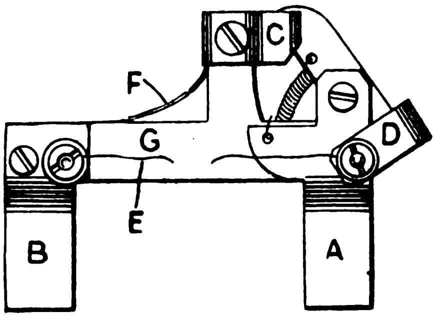

FIG. 2.

fuses. The plate, *c*, carries the other end of the secondary fuse, and connection is made with this by means of the lever work, *b*. The whole of the fuses are mounted on an insulated bar, *g*, the fuses being labeled *e* and *f* respectively. We are informed that these fuses have stood the test of practical work, but there are certain details in the samples which have been sent to us which should be modified before they are manufactured in great quantities.—The "Electrical Engineer," London.

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ELECTRICALLY-DRIVEN SHOPS.

BY E. BROOK.

The electrical driving of workshops is a subject that is very rarely touched upon by electricians-in-charge, though their experiences must often by very valuable.

In my own case, I have charge of the electrical department of a large engineering and boiler works in the Midlands. We have an average output of 600 units, four generators driving 25 motors, two electrical cranes, 30 arcs and about 600 16 cp. lamps. When I took my present situation, about 12 months ago, I was given to understand that I must get the plant in a thoroughly reliable condition and place everything on a very sound footing, so that only by something very extraordinary could anything go wrong. I find that engineers want electrical machines to be like engines and boilers, that is, thorough, and so that they will work well on overload, if necessary. Fuses they look upon with no favorable eye, because if every time a motor was started roughly in a boiler shop a fuse were to go you would require a man to stand by the motor. Likewise, employers do not like to be told every time there is a bit of trouble with the motor, "Oh! we must make a larger motor—this is overworked." Every dynamo and motor here is overworked, though we have no trouble with them now: they are submitted to very rough usage and stand it. They start at nearly double load and must be fused for above that amount. I got this result by two means—insulation and thoroughness. I found it was better to sacrifice a little efficiency in the armature to get good insulation.

We had three 6 hp. open type drum-wound motors, that were constantly burning out. The armatures were wound with .104 wire, and the current density was 3,000 amperes per square inch; they were rewound with .092 wire and better insulated. Result, slightly lower efficiency, current density 3,910, nine months' run without any attention.

We have a very large planing machine, worked by a 10 hp. motor, taking (at 110 volts) 80 amperes with the cut, 100 amperes when table is reversing, 150 amperes at point of reverse; the current density in the armature is 3,940 amperes per square inch. This armature was constantly breaking down until I converted it into a gramme wound armature, with the very best results.

A 12 hp. enclosed motor of a very good type was driving a second large planer taking 80 amperes; armature wire $\frac{7}{17}$ S.W.G.; current density 2,320 amperes to the square inch. This motor, after about one hour's run, would get unbearably hot; I had to take it out and put down a 10 hp. open type, wire $\frac{7}{18}$ S.W.G., current density 3,150, and that mended the trouble.

I find that brush rockers on motors are worse than useless, as men and lads will touch the machines, with the result that the brushes are often left in the wrong place. I have them all rigidly fixed in their correct position. Oil covers should be made so that they cannot remain open. Brush carriers would be more useful if made suitable for either gauge or carbon brushes, for use with gauze when the motor has to carry more current than the carbon brushes will allow, without heating the commutator. Motors are compelled to work overloaded at times, and an employer will not hear the tale that he cannot add another straw, so to speak, to his motor. If electricity is ever going to be a complete success for workshop use, it must be thoroughly reliable, and inspire confidence in men who do not understand the theory of electrical machinery, as the buyer is the man that must be most considered.

Each length of armature wire is treated with two coats of shellac varnish and baked; the armatures do not look quite so well as when they are varnished at the finish only, when the blemishes are covered up, and the holes filled with shellac, which, on the first heating of the armature, is thrown off inside the poles.

All our armature cores and field formers are covered with a thin layer of mica laid lengthways round them. The ends of the cores of slotted armatures are often left with only the usual insulation that is used inside the slot, extending to the corners, with the result that armatures soon get earthed. I remedied this fault by stripping the core and placing fiber washers at the ends, slotting the fiber to suit the slots in the core, and rounding the corners of the fiber.

Fuses are set at about 150 per cent. overload, which must look absurd and amazing to the arm-chair electrician. The reason is that the steam, towards mid-day, gets very low, causing the voltage to fall, which means a rise of amperage in all the motors, they having to start and work with a greater current. The proper thing to do would be to shut down some of the motors; but no! things must be kept going and not allowed to break down.

These experiences will show some of the difficult conditions that must be surmounted in workshop practice and a few of the ways of overcoming them.—"Electrical Review," London.

The New Electric Line of the Orleans Railway Company at Paris.

A description of the Orleans Railway Company's line in Paris, which is operated by electricity and is 4 kilometers in length, should prove interesting. There is a sub-station between the Austerlitz Depot and that of the Quai d'Orsay. The line throughout its whole length runs underground. An electrically operated transfer platform 9 meters long connects all the tracks on the Quai d'Orsay. This platform can carry electric locomotives of 50 tons. The amount of power required for these locomotives is 500 kilowatts and the current is supplied through a third rail from three sliding contact shoes, while overhead wires are utilized at the d'Orsay Depot and also for the switches. The power station at Ivry contains two electric generators of 1,000 kilowatts each producing a three-phase current of 5,500 volts pressure and a frequency of 25 alternations per second. These alternators were furnished by Portil Vinay of Paris and the steam engines by Dujardin of Lille. Two sub-stations transform this alternating current into a continuous current of 550 volts for power purposes and of 500 volts for lighting. The arc lamps are connected in series. The incandescent lamps are in 4 shunts supplied by a distribution system of five conductors from equalizing dynamos (boosters). There are two Tudor storage batteries of 1,100 ampere hours, of a capacity sufficient to regulate the load and to take up any sudden changes in the same; they are able to furnish light for several hours in case of a machinery break down. The electric plant was furnished by the French Thomson-Houston Company. The line has been in operation and open to the public for several weeks.

When the Electric Current is Dangerous to Life.

Some very interesting experiments have just been made in Zurich, Switzerland, with the object of ascertaining the precise conditions under which electricity is dangerous to human life. The general impression has been that currents of less than 500 volts could not be fatal, yet a few cases of deaths have been recorded through currents which were as low as 120 volts. Alternating currents of 100 volts have in like manner been regarded as absolutely harmless, yet experience shows that this conclusion is not always correct.

With the object of arriving at definite truth on the vexed question, Prof. Weber, a distinguished Swiss scientist, made several experiments on himself. He first made a test with 30 volts, and found that when he grasped the wires with moistened hands, his arms, wrists and hands were practically paralyzed. It was impossible for him to move a hand, an arm, or even a finger, and the pain in these parts of his body was so acute that he could not endure it for more than ten minutes. He also experienced considerable difficulty in freeing his hands from the wires. His next test was with 50 volts, and the pain in this instance was so acute that he could not endure it for more than two seconds.

Neither was it possible for him to free his hands from the wires; and for the reason that his hands and fingers were so benumbed by paralysis as to be practically lifeless. A similar result was obtained when he made tests with dry hands, but not until the intensity of the currents had reached 90 volts.

The conclusion at which Prof. Weber has arrived is that "there is danger in grasping the conductors of two alternate currents with the hands while in a dry condition whenever the difference between the intensity of the two conductors exceeds 100 volts." At the same time he points out that, while currents of such comparatively low intensity are dangerous, other currents of very high intensity are under different conditions absolutely harmless. In explanation it is said that these strong currents affect so quickly the surface of the body that it is impossible for them to press into the interior and produce physiological changes there.

Another notable discovery was made by Prof. Weber. He knew that many a workman had been killed while handling a conductor in which the current was 115 volts, while engineers had constantly handled a similar current without meeting with any injury, and he determined to find out why the current has proved so fatal in the case of workmen. One reason, he claims, is because engineers, owing to their training, are constantly on their guard against danger from electricity, and, furthermore, while performing such work are isolated from the ground through the soles of their shoes. The workmen on the other hand, sometimes work in their bare feet and sometimes in damp leather shoes, the result being that either through this dampness or through their own bodies a connection is established between them and the earth which necessarily leads to their death.

Prof. Weber's experiments have attracted widespread attention among scientists, and the belief among them is general that our knowledge of electricity is more likely to be increased by practical tests of this kind than in any other way.

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Count Zeppelin's Airship.

A cable dispatch to the N. Y. "Sun" says that, commenting upon his experiments in aerial navigation, Count Zeppelin corrects the idea that his machine is intended as a vehicle for ordinary transport. He aims with the vessel to be able to reach spots otherwise unapproachable, to seek undiscovered coasts, to carry dispatches to fleets and armies, and for observation.

For these purposes a navigable balloon is imperative, because if the motor machinery should break down the balloon could float until repaired, while on aerial ships or flying machines it is necessary with ordinary traffic to descend if the machinery is disordered, and all machinery must occasionally become disordered. For his purpose the balloon must travel many days without needing fuel, gas or provisions—must keep a certain pace, even against a moderate wind.

The first experiment on July 2, owing to the jamming of the steering apparatus and the sliding weights, which caused a premature descent, did not finally demonstrate the machine's ability to travel, but it proved of adequate construction in all other essentials.

When alterations are effected a satisfactory speed will probably result. Experiments have proved that the present sized screws are the most suitable. Larger screws would not increase the speed. Greater speed may be attained by more powerful motors, weighing the same as the present ones. This also means the reduction of the vertical diameter of the balloon, which the new metal, magnalium, an alloy of magnesium and aluminum, may render possible.

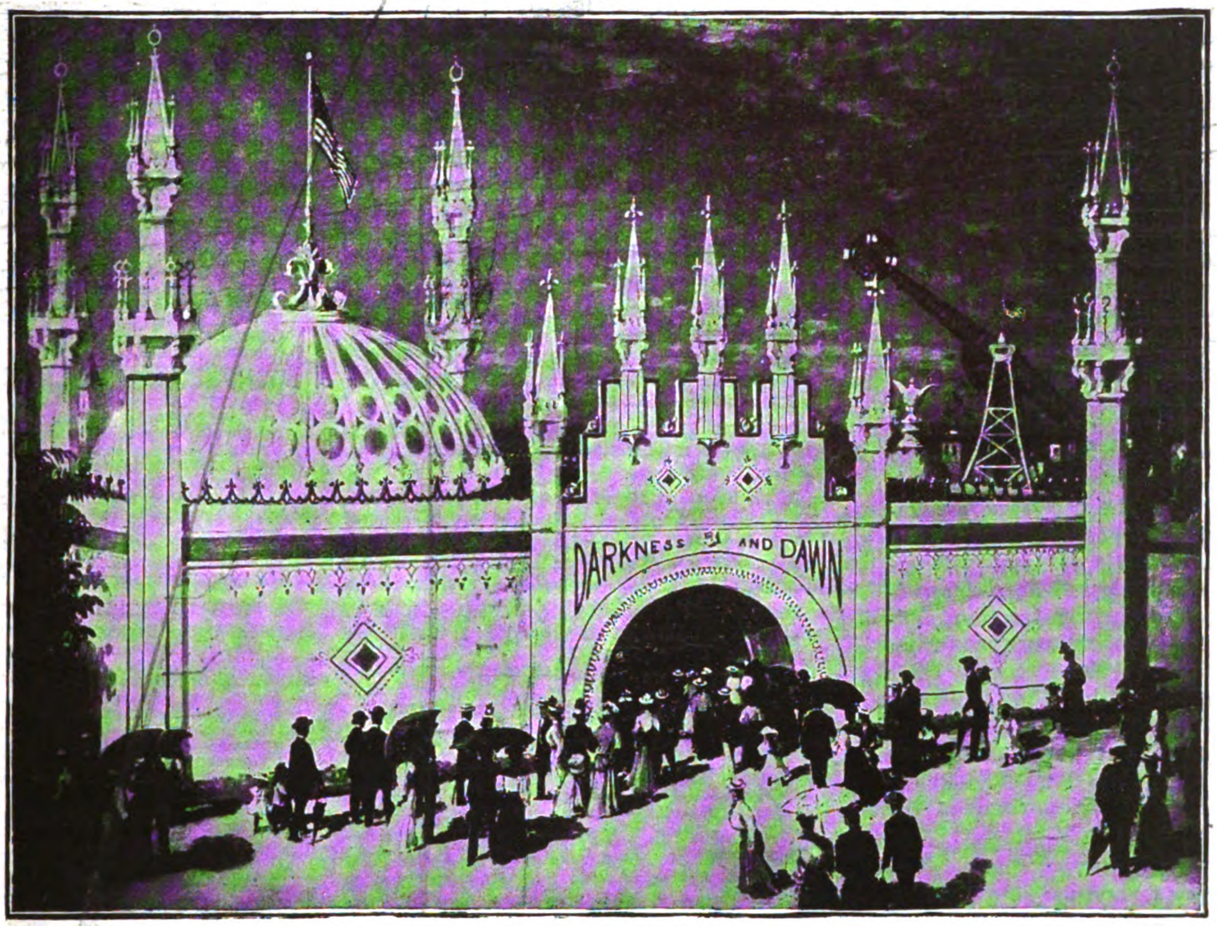
Descents must always be made against the wind with the balloon slanting in that direction. The balloon requires a landing place and shed, as a ship does a harbor and a dock. If she lands elsewhere she can easily be taken to pieces and transported in sections.

The expenditure has not been incommensurate with the object in view. As Count Zeppelin sums it up, if the present machine does not attain the desired speed, it is proved possible to build such a one.

"DARKNESS AND DAWN."

A Wierd and Fascinating Feature of the Midway at the Pan-American Exposition.

"Darkness and Dawn," which is to be one of the features of the Midway at the Pan-American Exposition in Buffalo next year, is a presentation of Dante's Inferno. It is remarkably realistic, with enough of comedy to relieve the gruesomeness that otherwise might jar sensitive natures. The visitor is taken in hand by guides and conducted to an elevator by which he seems to go down, down into hopeless darkness. As he steps from the cage he finds himself in a cool retreat with jovial companions, such as a living skeleton, a widow in her weeds, an undertaker or two. It is the threshold of the place which good people expect to avoid in the hereafter. The visitor, under the protection of guides is assured of safety. He is led through a series of corridors and grottos, along burning lakes and other devices of torture, where he may witness the punishment of those who juggle with the truth, who borrow umbrellas and neglect to return them, who gossip about their neighbors and who otherwise trespass on the rights of others. The lesson is a salutary one. Presently the scenes of purgatory are passed and the visitor comes to the "Grotto of Dawn," where maidens are dancing and singing and wonderful illusions greet the eye. The music and brilliant scenes form a happy ending of the journey. After tarrying a few moments in the grotto the visitor returns once more to the realm of every-day life.



"DARKNESS AND DAWN."—PAN-AMERICAN EXPOSITION.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

An incandescent coal oil lamp is the latest invention brought to the attention of Ottawa capitalists. A company is being formed for the purpose of manufacturing coal oil lamps, according to a model made by Mr. V. L. Emerson, the American scientist, who is now residing at Ottawa. The incandescence is created by blowing a thin stream of coal oil in a spray over a film, which is shaped like the Auer light burner, and the result is claimed to be a light of about twenty times the brilliancy of an ordinary 16 candle-power electric light. It costs only about one-tenth of a cent per hour. To an ordinary student's coal oil lamp, Mr. Emerson has attached a small box into which air is forced by means of a pump, and it is there compressed. The air is connected with the oil chamber, and the air, pressing upon the oil, forces it through a tiny hole in a pipe leading to the burner. This pipe is curved like the letter S, and when the oil escapes from the pipe, it is spray, and is cast over the film where it burns with great brilliancy. One of these lamps has been set up by the inventor and is giving wonderful light. A heating arrangement, on the same basis, is also said to be giving great results.

On July 31 the ratepayers of Brockville, Ont., voted on a by-law to raise $100,000 by debentures for the purchase of the plant of the Brockville Light & Power Company. About

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one-third of the eligible vote was only cast, and the by-law was carried by a majority of 404 votes. A by-law was also adopted favoring commissioners to manage the works, which will be taken over next October.

The Montreal Street Railway Company has introduced a new style of car on its lines. The car is 41½ feet long. It is closed in and has doors in the middle as well as the front and back. In the middle of this car is a sort of porch, open on one side, and before and behind this porch are two compartments, capable of holding 24 passengers each.

The town of Bracebridge, Ont., has passed a by-law to raise $27,000 by debentures for the purpose of extending the present power, putting in new water wheels and dynamos, etc. It is the intention to proceed with the work at once. Four contracts will be let, one covering excavating and rock work, another the dam and power house, the third, steel flume and water wheels and the fourth electric plant.

LONDON NOTES.

[From our London Correspondent.]

Electric Railroad Plans Wanted for London.

The directors of the Metropolitan and Metropolitan District Railway Companies, who, as announced in ELECTRICITY recently, have laid a short experimental electrical track between Earl's Court and High street, Kensington, have resolved to invite the leading electric traction firms to draw up and submit to them plans, specifications and detailed estimates and tenders for the necessary installation for the working of the complete undertaking by electricity. This contract will undoubtedly excite a great deal of keen competition between English electric traction engineers, and American contractors are sure, from indications, to be well to the fore with their proposals. The course which the companies have now adopted is to appoint a committee of six directors (three from the board of each company) "to consider the question of applying electric traction to the working of the inner circle line."

LEGAL NOTES.

A decision in the case of the Lyons (N. Y.) Electric Light Company against David Bastian and others has recently been handed down by the Appellate Division, Fourth Department, affirming the decision of Referee Smith of Canandaigua, N. Y., from whose judgment it was appealed. This is the action brought by the Electric Light Company against the South Lyons farmers to recover $500 damages for tearing away a portion of their dam on the Canandaigua outlet because it caused the water to overflow upon some of the land adjoining the river which belonged to the aforesaid farmers. The referee decided in favor of the plaintiff and the Appellate Division sustains this judgment. The case will probably be taken to the Court of Appeals.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended August 3:

Antwerp, 79 packages, $4,026; Argentine Republic, 3 cases automobile parts, $200; 145 packages, $5,672; 21 cases motors, $2,742; Australia, 61 cases $2,901; 38 packages, $3,500; Barcelona, 8 cases, $216; Brazil, 42 packages, $3,054; Bremen, 2 cases $160; British East Indies, 91 packages, $3,054; British West Indies, 4 cases, $79; Brussels, 3 packages, $11; Central America, 13 packages, $375; Cuba, 24 packages, $299; Ecuador, 18 packages, $270; Genoa, 7 cases, $625; Glasgow, 45 packages, $3,100; Hamburg, 41 packages, $3,850; Havre, 90 packages, $12,841; Liverpool, 114 packages, $2,241; 138 trolley poles, $4,897; London, 111 cases, $8,644; Lyons, 14 cases motors and parts, $2,750; Manchester, 28 packages, $1,724; 1 case, $10; Marseilles, 85 packages motor trucks, $4,750; Mexico, 22 cases, $193; 97 packages, $12,975; Naples, 49 packages, $11,296; Newcastle, 7 packages, $875; Nova Scotia, 25 packages, $238; Peru, 6 cases, $154; Southampton, 9 cases, $389; 4 packages, $207; St. Petersburg, 1 case, $15; U. S. Colombia, 26 packages, $904; Venezuela, 106 packages, $901.

PERSONAL MENTION.

Mr. John I. Sabin, president of the Pacific States Telephone & Telegraph Company, San Francisco, Cal., is at work on the preliminary details of establishing in Portland, Ore., the executive headquarters of the consolidated telephone companies.

INCORPORATIONS.

The Standard Electric Company- Trenton, N. J.—to deal in all business pertaining to electrical construction. Capital stock, $25,000. Incorporators: James W. Sawyer, Benjamin L. Cotes and Francis C. Lowthorp.

The Darlington Electric Fountain & Display Company. Camden, N. J.—to manufacture and sell electric supplies. Capital stock, $100,000.

The Globe Electrical Manufacturing Company, Philadelphia, Pa.—to manufacture and deal in electrical supplies. Capital stock, $250,000. Incorporators: G. E. Cooling, A. G. Coolidge, W. Mason, W. L. Tater and D. R. Paterson, all of Philadelphia.

The Keokuk Electric Railway & Power Company, Keokuk, Ia. Capital stock, $400,000. Incorporator: J. C. Hubinger of Keokuk.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED JULY 31, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

654,586. Conduit Electric-Railway System. Frank M. Ashley, New York City, assignor to the General Electric Company of New York. Filed Feb. 26, 1898.

654,632. Gear for Motor-Cars. Jean J. Heilmann, Paris, France. Filed Dec. 19, 1899.

654,658. Electric Railway. Gustav A. Lyncker, Munich, Germany. Filed April 23, 1900.

654,803. Trolley-Wheel. Stephen G. Reynolds, Easton, Pa., assignor of one-half to Nat Freeman, same place. Filed Dec. 11, 1899.

654,854. Car-Fender. George D. Smith, Paterson, N. J. Filed March 30, 1900.

655,014. Trolley. Felix J. Rogers, Crafton, Pa. Filed Jan. 3, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

654,679. Electric-Arc Lamp. Carl Schuster, Pittsburg, Pa., assignor to Pittsburg Electrical & Machine Works, same place. Filed June 13, 1899.

654,821. Flash-Light System. Martin Wright, San Antonio, Tex. Filed April 28, 1900.

654,923. Lamp-Post. George D. Scott, Birmingham, Ala., assignor to the Kitson Hydrocarbon Heating & Incandescent Lighting Company, Philadelphia, Pa, Filed March 26, 1900.

655,041. Light Especially Adapted for Electric Headlights for Locomotives. William H. Young and Stephen A. Hayes, Sanford, Fla. Filed March 14, 1900.

655,063. Electric-Arc Lamp. James E. Davidson, Butte, Mont. Filed Oct. 17, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

654,583. Machine for Winding and Insulating Electric Coils. James C. Anderson, Jersey City, N. J. Filed Feb. 7, 1900.

654,595. Method of Operating Dynamo-Electric Machines. Ernst J. Berg, Schenectady, N.Y., assignor to the General Electric Company of New York. Filed May 26, 1900.

654,663. Electric Regulating Device. Walter S. Moody, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 21, 1900.

654,698. Electrical Igniter for Hydrocarbon-Engines. Hugo Wegelin, Augsburg, Germany. Filed Feb. 16, 1899.

654,700. Electric Controller. William Asbury, New York City. Filed Dec. 1, 1899.

654,734. Electric-Commutator Cleaner. August H. Jahn, Homestead, Pa Filed Nov. 23, 1899.

654,752. Speed-Governor Attachment for Electrical Apparatus. James H. McGurty, Jersey City, N. J., assignor of forty-nine one-hundredths to Thomas McEwan, Jr., same place. Filed April 25, 1900.

654,847. Automatic Circuit-Breaker. William M. Scott, Philadelphia, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed Nov. 1, 1897.

654,848. Automatic Magnetic Circuit Breaker. William M. Scott, Philadelphia, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed Jan. 5, 1898.

654,883. Motor-Controller. William R. Elliott and John W. Eskholme, Westfield, N. J., assignors to the C. & C. Electric Company of New Jersey. Filed April 2, 1900.

654,999. Electric Motor. Walter S. Moody, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 7, 1898.

655,047. Quick Break Electric Switch. William F. Bossert, Utica, N. Y., assignor to the Bossert Electric Construction Company, same place. Filed March 10, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

654,747. Supervisory Signal for Telephone-Switchboards. Frank R. McBerty, Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Nov. 13, 1897.

654,748. Telephone Toll Apparatus. Frank R. McBerty, Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Nov. 13, 1897.

654,749. Signal Appliance for Telephone-Switchboards. Frank R. McBerty, Downer's Grove, and James L. McQuarrie, Chicago, Ill., assignors to the Western Electric Company, Chicago, Ill. Filed Nov. 22, 1897.

654,750. Switchboard for Telephone-Lines. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill Filed Dec. 26, 1899.

654,758. Apparatus for Telephone-Switchboards. Joseph J. O'Connell, Chicago, Ill., assignor to the Western Electric Company, same place. Filed May 12, 1899.

654,924. Switchboard for Telephone Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 26, 1899.

655,113. Electromagnetic Telephone. Andrew Plecher, Savannah, Ga. Filed Feb. 16, 1900.

655,164. Connection-Counter for Telephone-Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 13, 1897.

SIGNALS AND SIGNALING APPARATUS.

654,625. Signaling Device. John L. Hall, Schenectady, N.Y., assignor to the General Electric Company of New York. Filed May 10, 1900.

654,967. Electric Signal and Fire-Alarm. David Geywits, Rome, and William Still, Utica, N.Y., assignors to Michael H. Powers, Rome, N.Y. Filed Feb. 16, 1900.

655,144. Electric-Signal-Registering System. Otto P. Yurgae and Robert H. Yurgae, Milwaukee, Wis., assignors, by direct and mesne assignments, to the Yurgae Signalphone Manufacturing Company, same place Filed May 14, 1900.

MISCELLANEOUS.

654,630. Radiophony. Hammond V. Hayes and Ernest R. Cram, Cambridge, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed June 7, 1897.

654,656. Elevator-Controller. Nils O. Lindstrom and Allan Cowperthwait, New York City, assignors to A. B. See Manufacturing Company. Filed April 11, 1900.

654,703. Means for Connecting Cables. Nathan Bassett, Philadelphia, Pa., assignor to the Globe Telephone Manufacturing Company, same place. Filed Dec. 30, 1899.

654,742. Automobile Truck. Hosea W. Libbey, Boston, Mass. Filed Oct. 18, 1899.

654,816. Electrical Transmission of Power. Imle E. Storey, Trenton, N. J. Filed Nov. 18, 1899.

654,834. Secret Telegraph-Sounder. George H. Landgraf, Waterloo, Wis. Filed June 21, 1898.

654,851. Semaphore-Operating Mechanism. Judson Shoecraft, Eskridge, Kan., assignor to Charles C. Gardiner, Bradford, Kan. Filed Oct. 10, 1899.

654,871. Electric Cable. John Y. Buchanan, Edinburgh, Scotland. Filed May 18, 1900.

654,903. Power Transmission. Allen Loomis, Jackson, Mich. Filed Sept. 29, 1899.

654,937. Phonograph Attachment. Joseph N. Blackman, East Orange, N. J. Filed March 26, 1900.

654,951. Process of Manufacturing Composition Applicable for Electric Insulation, William J. Cordner, London, England, assignor to Louis D. Brandeis, trustee, Boston, Mass. Filed Oct. 17, 1899.

654,952. Composite Material Applicable for Electric Insulation. William J. Cordner, London, England, assignor to Louis D. Brandeis, trustee, Boston, Mass. Original application filed Oct. 17, 1899. Divided and this application filed Feb. 6, 1900.

655,006. Electric Lock. Theodore P. Pratt, Boston, Mass., assignor to Fred Warren Clark, same place. Filed April 21, 1900.

655,032. Rectifying Alternating Currents. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed March 28, 1900.

655,057. Thermostat and Alarm Circuit Controlled Thereby. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Sept. 8, 1899.

655,111. Electrolytic Apparatus. Andrew Plecher, Savannah, Ga. Filed Jan. 20, 1900.

DESIGNS.

33,036. Electric Lamp Holder. William Roche, Jersey City, N. J. Filed June 27, 1900. Term of patent 7 years.

33,043. Automobile-Frame, George T. Turner, Philadelphia, Pa. Filed May 16, 1900. Term of patent 14 years.

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THE TELEPHONE WORLD.

One Way Adopted by the Bell Monopoly to Crush the Independent Movement.

The Central Union Telephone Company, a Bell organization, has begun suit in the Circuit Court of the United States for the Northern District of Ohio, Western Division, against the Bryan Telephone Company, an independent organization doing business in the town of Bryan, O. The remarkable part of this litigation is the ground on which the suit was brought by the Bell concern, and which is clearly set forth in the following letters and civil action petition:

THE INDEPENDENT TELEPHONE ASSOCIATION OF THE UNITED STATES OF AMERICA,
CLEVELAND, O., July 28, 1900.

ELECTRICITY PUBLISHING COMPANY, New York.

Gentlemen: Enclosed I send you copy of petitions and correspondence in suit of the Central Union Telephone Company against the Bryan Telephone Company of Bryan, Ohio, which will no doubt be of interest to your readers.

The Independent Telephone Association, as you will see from the correspondence, now has charge of this litigation. We feel that the facts surrounding this suit gurantee this provision, as it is only the result of feeling growing out of strong opposition.

The agents of the Bryan Telephone Company in this case were acting as the agents of persons desiring the removal of the Central Union telephones from their premises; at the request of persons desiring to dispense with the Central Union service, after refusal on the part of that company remove their instruments.

Thinking that this would be of interest to you, I voluntarily send it for your use if you so desire. Yours very truly,

(Signed) JAMES M. THOMAS,
President.

CLEVELAND, O., July 20, 1900.

Will W. Morrison, Bryan, Ohio.

Dear Sir: I have just noticed in the Bryan "Press," under date of July 19, that suit has been brought by the Central Union Telephone Company against the Bryan Telephone Company to the United States Court at Toledo, asking $10,000 damages alleged to have resulted to the Central Union Telephone Company by reason of opposition of your company; further alleging that you have damaged them in other cities in Ohio, Indiana and Illinois.

You deserve the backing of other independent telephone interests throughout the country, as all are very busy building up business at reasonable prices, in opposition to the old telephone companies who have sought to unduly prolong a monoply.

Therefore, as President of the Independent Telephone Association of the United States of America, in behalf of the Association, I hereby tender you any assistance that you may desire or will accept in defending yourself against this most absurd and ridiculous charge.

Please let me know if you desire the Association to take part in this litigation, and if so we will have our attorneys take the matter up at once. Yours very truly,

(Signed) JAMES M. THOMAS,
President.

BRYAN, Ohio, July 21, 1900.

James M. Thomas, President Independent Telephone Association U. S. A., Cleveland, O.

Dear Sir: Replying to your favor of July 20, I have to say that I am authorized to accept the offer of assistance from the Independent Telephone Association of the United States in defending ourselves against the action brought against us by the Central Union Telephone Company.

We feel that we deserve the support of the independent companies as we have done nothing more than every company is doing in its fight against the Bell monopoly, and should that company be able to recover damages it would simply mean that we could be prevented from soliciting subscribers from our competitors.

This action appears to be a new method on the part of the Bell Company of harassing and embarrassing the independent companies. Respectfully yours,

(Signed) WILL W. MORRISON,
President.

CIVIL ACTION PETITION.

In the Circuit Court of the United States for the Northern District of Ohio, Western Division.

Central Union Telephone Company (a corporation) plaintiff vs. the Bryan Telephone Company (a corporation) William W. Morrison, and Ira E. Gardner, defendants.

To the Honorable Judges of said Court:

The Central Union Telephone Company, a corporation and a citizen of the State of Illinois, brings this, its bill against the Bryan Telephone Company, a corporation and a citizen of the State of Ohio, and William W. Morrison, and Ira E. Gardner, all of Bryan, Ohio, and citizens of the State of Ohio, and residents and inhabitants of said district.

Thereupon your orator complains and says that plaintiff herein is a corporation duly organized under and pursuant to the laws of the State of Illinois, owning and operating telephone lines and exchanges throughout the States of Illinois, Indiana and Ohio, and in and through the County of Williams, and State of Ohio; also in and through the village of Bryan in said county, and through said lines and exchanges having and operating telephonic connection and communication for its subscribers throughout its entire system and with other systems of telephone service distributed over a large number of other States within the United States of America.

That said defendant, the Bryan Telephone Company, is a corporation duly organized under and pursuant to the laws of the State of Ohio, and owning and operating lines of telephone and telephone exchanges in said village of Bryan, County of Williams and State of Ohio; that said defendant, William W. Morrison, and Ira E. Gardner are large owners of stock in said Bryan Telephone Company, and are also officers and agents of and for said Bryan Telephone Company.

Your orator says that it has been established and maintained and is still maintaining, at great expense an exchange for telephone service, together with lines of wire, poles and other necessary fixtures for operating the same, within said village and county, and that said telephone exchange and lines are connected with and form a part of its system of telephone service and communication, as hereinbefore set forth, and through its said exchange and lines within the village of Bryan, County of Williams and State of Ohio, it is furnishing telephone communication, and service to a large number of subscribers within said village and county, and that said telephone communication and service is maintained by this plaintiff for the benefit of its said subscribers within said village and county; also to make possible telephonic communication with said subscribers and its numerous other subscribers at its other exchanges and connections throughout its entire system, and that the value of its said system depends largely on the maintenance of such connection and communication with all subscribers at all and each of the exchanges connected with, and forming a part of said system.

Your orator says that at sundry times during the month of June, 1900, and before and since, said defendant, the Bryan Telephone Company, through its said officers and agents, and through other of its employes, called upon a large number of plaintiff's subscribers in the village of Bryan, and by persuasion, misrepresentation, threat and intimidation induced a large number of said subscribers to sign a printed form of notice to plaintiff to discontinue its telephene service to said subscribers, and did forcible, wrongfully and unlawfully interfere with the property of plaintiff, to wit, its telephones, wires and other fixtures connecting said telephone with plaintiff's exchange in said village, and said defendants through their employes did disconnect said telephones, break and cut said wires, and remove the same from their proper position and fastenings, thereby injuring and destroying said property belonging to the plaintiff, and cutting off plaintiff's communication with its said subscribers, so that plaintiff was and still is unable to furnish telephone service between said subscribers and all other subscribers connected with plaintiff's said exchange, both within said village of Bryan and plaintiff's other numerous exchanges located and operated in the various cities, towns and villages of said States of Ohio, Indiana and Illinois, and also with other parts of its connecting lines extending over and through the territory hereinbefore described.

Your orator says that the threats and intimidations hereinbefore referred to consisted in defendants threatening many of said subscribers that unless said subscribers should discontinue the service of plaintiff and use that only of defendant, the Bryan Telephone Company, said defendants would use their influence to injure and ruin the business of said subscribers; and that said subscribers fearing and believing that said defendants would do as they had threatened to do, did discontinue the service of this plaintiff, to plaintiff's great damage.

Your orator further says that said defendants have induced many of plantiff's subscribers to form combinations and agreements against the use of plaintiff's said service, to the great annoyance and interference with plaintiff's business, and to plaintiff's great damage, and that said defendants have also wrongfully and unlawfully threatened to do injury to the private business of many of said subscribers, unless said subscribers should discontinue the service of this plaintiff, and by uch wrongful and unlawful threats, said defendants have induced and caused a great many of plaintiff's said subscribers to discontinue said service, thereby greatly impairing the service furnished by plaintiff to its numerous other subscribers, and to and with the general public.

Your orator further says that said defendants, by said wrongful and unlawful acts, have done great injury to plaintiff's property, and have seriously impaired and greatly injured plaintiff's business and service within said village of Bryan, and elsewhere throughout plaintiff's system, all to plaintiff's great damage in sum of ten thousand ($10,000.00) dollars.

Wherefore your orator prays the court for judgment against said defendants in the said sum of ten thousand ($10,000.00) dollars.

TOUVELLE, MASTERS & ADAMS,
Attorneys for plaintiff.

According to recent news received from Kansas City, Mo. the telephone will supersede the telegraph to a great extent on the Santa Fe system. The company now has in operation on its Chicago, eastern and middle divisions a private telephone system connecting a large number of the block signal stations, and the passage of trains in and out of the various blocks now is scheduled from operator to operator by telephone instead of telegraph as heretofore. However, the management of the road believes in the telephone as a means of communication in railroad work only to a limited extent. Simultaneous with the establishment of the system an order was issued prohibiting absolutely the use of the telephone for the transmission of train orders. The question of substituting the telephone for the telegraph in railroad work is one that now is being earnestly considered by railway managers. The Pennsylvania officials have gone so far as to supersede the telegraph on a portion of the system with the telephone and the experiment is said to be a success. It is believed by some managers that the danger of mistakes can be greatly lessened by the use of the telephone. The only difficulty to be considered in the matter is the frequency with which the average telephone gets "out of order." If interest in the telephone as a successor to the telegraph continues the Santa Fe probably will decide upon a more extended test.

News from Minneapolis, Minn., states that a million dollars has recently been added to the capital of the Mississippi Valley Telephone Company for enlargement purposes. Chicago and St. Paul capitalists have, it is understood, subscribed the new capital. A sub-exchange is to be established in the Midway district soon. A franchise has also been secured for the opening of an exchange in South St. Paul, and through this a number of cities will be added to the list of those already reached by the long-distance wires of the company.

The work on the Cumberland Telephone line between Waverly and Linden, Tenn., is being pushed rapidly. All the material is now on the ground and the line is in working order as far as Bakerville. The line when completed will have a double circuit and will touch every point of importance in Humphreys and Perry Counties. The line will be completed by Sept. 1.

Manager Porter of the Inland Telephone Company, with headquarters in Baker City, Ore., visited the Baisley-Elkhorn mine a short time ago to make arrangements to connect that mine and others on Elkhorn Mountain with the through line from Baker City. Telephone connection between the Baisley-Elkhorn mine and Baker City will be a great advantage to both the mine and that city.

A stock company of local business men has lately been incorporated under the laws of the State of Wisconsin, and will put in a local telephone exchange at Baldwin, using the National Automatic system. The system will be in working order in three months.

The Carroll County Telephone Company, with headquarters at Huntingdon, Tenn., is extending its lines and now has connection with Decaturville. It will soon connect with Dresden and Weakley County.

TELEPHONE INCORPORATIONS.

The Wisconsin River Telephone Company, Stevens' Point, Wis.—to operate a local exchange in connection with the Wolf River toll line. Capital stock, $25,000. Incorporators: F. L. Dille and John Reton, Stevens' Point, and A. L. Hutchinson, Weyauwega.

The Long Distance Telephone Company, Staunton, Va.,—to operate a telephone line. Capital stock, $100,000. Incorporators: J. R. Kemper, W. H. Laughlin, F. M. Hanger, N. C. Watts, A. Bowling, E. Echols, all of Staunton; J. S. Cochran of Folley Mills and J. F. Clemmur of Middlebrook.

The Hampton Telephone Company, Hampton, Va. Capital stock, $25,000. Incorporators: W. E. Lawson, H. W. Saunders, both of Hampton.

The Northern New York Telephone & Telegraph Company, Chicago, Ill. Capital stock, $200,000. Incorporators: A. E. Stilwell, G. E. Milligan, D. S. Lander, S. B. Willey, M. Hubbert, all of Chicago.

The Liter Arcadia Telephone Company, Arcadia, Ill. Capital stock, $1,500. Incorporators: B. F. Henderson, D. E. Kennedy and L. A. Barr.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Aberdeen, S. D.—Fire totally destroyed the gas and electric light plant at this place last week, involving a heavy loss; partially insured.

Albany, N. Y.—A certificate was lately filed here to the effect that the Queens Electric Light & Power Company has merged with the Electric Illuminating & Power Company of Long Island City, Jamaica Electric Light Company, and the New York and Queens Gas & Electric Company.

Altona, Ill.—According to the statement of the managers, the electric light plant at this place which burned down recently is to be running again in sixty days.

Asheville, N. C.—The W. T. Weaver Company of this place recently secured a charter and will establish an electric power plant on the French Broad River near here, for the purpose of supplying power for factories, electric light, etc., with $30,000 capital stock.

Batesville, Ark.—The demand for electric lights has grown to such an extent during the year and a half the plant has been in operation here, that the city is compelled to enlarge its capacity.

Birmingham, Ala.—The light committee is considering the question of erecting a municipal electric light plant.

Carlyle, Ill.—The prospects for the early establishment of an electric light plant here are quite favorable.

Cass Lake, Minn.—This place is to have electric lights and waterworks.

Cato, N. Y.—The question of erecting an electric light plant at this place is being considered.

Chambersburg, Pa.—The voters of this place have decided to issue $13,000 bonds for improving the town's electric light plant.

Cleburne, Tex.—The city council recently granted a franchise to Emmet Ellis of Dallas to put in an electric light plant and steam heating apparatus.

Dayton, O.—The National Cash Register Company is preparing plans for a complete new electric light plant at its works. E. A. Deeds, electrical engineer.

Dothan, Ala.—Bids will be received in about 30 days for erecting a municipal electric light plant to operate twenty-five 1,200 c.p. arc and 1,000 16 c.p. incandescent lights to cost $10,000.

Dublin, Ga.—This city contemplates increasing the capacity of its electric light plant. T. D. Smith, clerk.

Evansville, Ind.—The waterworks board has rejected all bids received for erecting an electric light plant at the new waterworks station, and will readvertise the work.

Evergreen, Ala.—This city will build a $25,000 electric light plant and waterworks. T. D. Jackson, city clerk.

Galesburg, Ill.—This city is figuring on putting in an electric light plant of its own, and L. E. Myers of the Peoria & Pekin Terminal Company is among the bidders.

Heyworth, Ill.—The people here expect to have an electric light plant soon.

Horseheads, N. Y.—The taxpayers of this village will decide whether the corporation will have electric lights early this month. Two propositions will be submitted. One is, whether the village shall construct a plant at a cost not to exceed $20,900; the other is whether the budget shall be increased in order to allow the trustees sufficient funds to procure light from the Elmira Illuminating Company.

Hot Springs, Ark.—The Hot Springs Street Railway Company has decided to erect a complete electric light and power house in this city to furnish power to operate its system and supply light for commercial purposes.

Jackson, La.—Bids are asked by the board of administration of the State Insane Asylum for erecting an electric light plant. Dr. G. A. B. Hays, superintendent.

Kenton, O.—Kenton is to have a new electric light plant, a number of leading citizens having become incorporated for that purpose with a capital stock of $20,000.

Mansfield, O.—The city council is considering the question of erecting an electric light plant.

Mazo Manie, Wis.—It has been decided by the village board to rebuild the electric light plant recently destroyed by lightning.

New Albany, Ind.—An ordinance was recently introduced in the council granting to the New Albany City Water & Light Company a franchise for the construction and operation of an electric light plant.

Newport News, Va.—By the first day of January, 1901, the citizens of this place will, it is expected, be using electric lights supplied from a new plant not now even in existence.

North Brookfield, Mass.—T. C. Perkins of Hartford, Conn., is interested in the possibility of getting a system of electric lighting installed in this town. It is understood that the company he represents is to ask for a franchise soon.

Portland, Mich.—Prof. Jones is preparing plans and specifications for an electric light plant at this place.

Prattville, Ala.—This town contemplates erecting an electric light plant.

Shakopee, Minn.—Bids for an electric light plant are desired.

Shawano, Wis.—The citizens will on August 24 vote upon an ordinance authorising the putting in of a combined electric light and waterworks plant.

South Boston, Va.—J. A. Mebane, electrical engineer of the Electric Light and Power Company of this place, wants bids on 500 kilowatt capacity generator for power plant; also 600 horse power in water wheels.

Spencer, Ia.—The electric light plant here is to be enlarged.

Syracuse, Ind.—Syracuse has contracted for an electric light plant.

Toledo, O.—A new electric light plant will be installed at an approximate cost of $10,000 in the Toledo State Hospital. Governor Nash has approved the plans drawn by Prof. Thomas of the Ohio State University for the improvement. Bids for same will be received until August 27. Address H. A. Tobey, Superintendent Toledo State Hospital, Toledo, Ohio.

Watertown, N. Y.—A contract to build a village was let in this city last Wednesday. The contracting parties were the St. Regis Paper Company and Sandford Peters, a builder of this city. The village is to be called Eggleston, and will be lighted by electricity.

STREET RAILWAYS.

Alden, Ia.—An effort is being made to construct an electric railway from here to Britt, a distance of 40 miles, in the near future. L. Soule of Chicago, and Judge Porter recently made a proposition to that effect.

Allegheny, Pa.—A charter was granted to the Northeastern Street Railway Company to build an electric railway 4 miles long in this city. The capital is $24,000. Ed. J. McIllvain is president of the concern.

Augusta, Me.—A concern is about to be formed which will be known as the Lewiston, Winthrop & Augusta Street Railway Company and the petition asks for the construction of a line running through Augusta, Manchester, Winthrop, Monmouth and Wales, to the terminus of the Lewiston, Brunswick & Bath Street Railway at the town of Webster, making a total length of about 27 miles of railway. The capital stock of the company is $160,000. H. M. Heath of this city is interested.

Boughtonville, O.—An electric line connecting Norwalk, Fairfield, this place and Chicago Junction is now being talked of.

Brazil, Ind.—A movement is on foot for the construction of an electric line between this city and Diamond, Parke County, touching Benwood, Cardonia, Carbon, Perth and a number of coal mines on the line.

Bridgeport, O.—The Bridgeport & Cadiz Interurban Railroad Company will operate an electric railway from this place to Cadiz via Mt. Pleasant, Dillonvale, Harrisville and St. Clairsville, on a capital of $10,000. This concern was incorporated by Charles H. Taney, A. B. Butler, W. W. Meek, C. A. White and Ernest T. Finley.

Brooklyn, N. Y.—The Brooklyn Rapid Transit Company which acquired the Old Sea View Elevated structure some two years ago, intends constructing in place of the old line a surface trolley road from West Brighton to Brighton Beach. The distance is about one and one-eighth mile.

Grass Lake, Mich.—The Power Company of Allegan will shortly ask the city council here for a franchise for an electric road through this village.

Jacksonville, Fla.—A proposition to build an electric line in this city has been made by W. B. Owen and others.

Morristown, N. J.—A movement is on foot here for the introduction of a trolley line running from Chatham through Whippany, Hanover and this place, and thence to Dover.

Nescopeck, Pa.—A trolley line which will connect Riverside, Danville, Bloomsburg, Espy, Lime Ridge, Berwick and this place will soon be constructed.

New Philadelphia, O.—The county commissioners have granted a franchise for an electric railway from here to Strasburg over the Wooster road. This will be a link between an electric line to connect Cleveland and Wheeling via Cadiz, Dennison and Uhrichsville, New Philadelphia and Akron.

Pass Christian, Miss.—Chicago capitalists will take hold of the Mississippi project and build an electric line between this place and Biloxi.

Rensselaer, Ind.—There is said to be a movement on foot to run an electric railroad from Paxton to this place, passing through Cissna Park, Milford, Sheldon and Brook.

Selma, Ala.—H. M. Abbott and associates recently purchased the franchise together with all the property of the Selma Street and Suburban Railroad Company, and intend equipping the line with electricity at an early date.

Seymour, Ind.—Daniel Lesley and A. W. Moon, of Indianapolis, have secured a franchise for an electric line at this place.

Tower City, Pa.—A project is on foot to connect with trolley the Schuylkill County towns of Orwin, Reiner City, Donaldson, Tremont, Newtown, Swatara, Minersville and this city.

Utica, N. Y.—It now looks as though the proposed electric railway between Little Falls and this city would be a sure thing. Thomas O'Shea of New York City is one of the promoters.

MANUFACTURING.

Cincinnati, O.—A new plant for the manufacture of electric motors has been started here, and will be in operation within two or three months. The concern is the Cincinnati Electric Motor Company, and it will shortly be incorporated with a capital of $100,000.

New Haven, Conn.—The Franklin Electric Manufacturing Company of this city has recently filed in the State Secretary's office a certificate of organization. Among those interested are Jonathan Camp and John Waring of Hartford, and Charles E. Hills of Elizabeth, N. J.

New York City.—The Bullock Electric Manufacturing Company is beginning to make shipments on the $500,000 contract lately made with a French syndicate for electrical equipment for street railways in different parts of the Eastern Hemisphere.

COMPANY MATTERS.

Milwaukee, Wis.—The Johnson Electric Service Company was recently reincorporated with a capital of $800,000. The main reason for the enlargement of the capital was to consolidate the various branches of the business in the eastern and middle States, which are being run independently of each other, manufacturing the Johnson patented articles in the electric and pneumatic lines. These, it is understood, will all be gathered in and owned by one corporation and controlled from the Milwaukee headquarters.

POWER AND TRANSMISSION PLANTS.

Redlands, Cal.—The California Power Company was lately incorporated to construct a plant upon the Kern River and to furnish electric light and power for Los Angeles and other cities in Los Angeles, San Bernardino, Riverside, Orange and Kern Counties. Henry Fisher, H. H. Sinclair, George B. Ellis, Frank P. Morrison and B. O. Johnson are the directors for the first year. The company's capitalization is placed at $2,500,000, of which $601,000 is subscribed.

Rock Island, Ill.—The stockholders of the People's Power Company are about to increase the capital stock from $300,000 to $600,000. The company owns the gas and electric plants of Rock Island and Moline and furnishes electric power to consumers. The plants are to be enlarged.

Rutland, Vt.—Articles of association have recently been filed with City Clerk H. B. Whittier for the Chittenden Power Company with a capital stock of $50,000. The purpose of the corporation is to develop, construct and operate power plants; to produce, transmit and sell power, light and heat of electricity or otherwise, and to buy and sell lumber and wood.

San Francisco, Cal.—The Fort Miller Power Company was recently formed with a capital stock of $1,000,000 for the purpose of generating and transmitting electrical power. Among those interested are W. Saunders, A. J. Morganstein, T. O. Carter, K. D. McCann and F. G. Berry.

St. Louis, Mo.—At a recent meeting of the stockholders of the Laclede Power Company it was voted to increase the capital stock to $800,000. The company will erect its own power plant.

MINES.

Dravosburg, Pa.—The Monongahela Consolidated Coal & Coke Company is preparing to put in one of the most recent improved electric haulage systems to supply power for all the mines in the neighborhood of Dravosburg, Camden and Street's Run. The plant will be located, it is said, in Buttermilk Hollow. Mifflin township.

Pittsburg, Pa.—The Lake Shore coal mine, an independent concern, is installing electric power to operate its mine to cost $15,000. Power had previously been furnished by the Pittsburg Coal Company, but when C. H. Wisser, the owner, refused to sell or enter the combination, the power was shut off.

AUTOMOBILES.

Bristol, Conn.—J. T. Case is at the head of a movement to establish a company here to manufacture automobiles, having patented a new style of rotary engine at which he has been at work for the past nine years.

Faribault, Minn.—A company of Eastern capitalists has rented the shoe factory building here, and will manufacture automobiles.

Newark, N. J.—The Spurr Automobile Company had its articles of incorporation recorded with the county clerk recently. It will manufacture steam, gasoline and electric vehicles. The capital stock is $100,000. Charles W. Spurr, Jr., Frederick W. Barker and Cyrus P. Baker, Jr., are all interested. The company will have an office at 480 New Jersey Railroad avenue.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Aug 6						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1¼ % Q.,	123	124
Allentown Pa.—Aug 6:						
Allentown & Lehigh Val. Trac. Co.	..	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Aug 6:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	105	...
Baltimore Md—Aug 6:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.—Aug 6						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	139	140
Brooklyn N. Y.—Aug 6:						
Brooklyn City Ry.	100	2,000,000	1,928,400	....	281	233
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	57⅜	57½
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	2½ % Nov., '99.	326	330
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co.	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad.......pfd.	......	6,000,000	6,000,000	....	77	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—Aug 6:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co.	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Aug 6						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Aug 6						
Charleston City Ry. Co.	50	100,000	100,000	3 % S.	..	..
Enterprise City RR. Co.	25	1,000,000	250,000	....	..	..
Chicago, Ill.—Aug 6						
Chicago City Ry. Co.	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	247	250
Chicago & South Side R. T. RR.	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000	....	9⅞	10½
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	27	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	77	78
North Chicago Street RR.	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	200	204
South Chicago City Railway	100	2,000,000	1,608,200	....	96	99
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	103	103½
Union Traction Ry............com.	....	1,250,000	624,900	85 %	14⅛	15⅛
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	57	59
Cincinnati, Ohio.—Aug 6:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—Aug 6						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry.	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—Aug 6						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry.	100	....	1,200,000	....	175	..
Rapid Railway Co.	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—Aug 6						
City Railway Co...............com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Aug 6:						
Hartford Street Ry. Co.	100	$4,000,000	$200,000	3 % S., Oct.,	150	–
Hartford & West Hartford RR......	100	1,000,000	247,000	....	--	–
Holyoke Mass.—Aug 6.						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—Aug 6.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	–
Indianapolis, Ind—Aug 6.						
**Indianapolis Street Ry.	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Aug 6						
Pennsylvania Traction Co.	100	10,000,000	9,900,000	....	--	–
Lancaster & Col. Electric Ry.....	....	....	87,500	....	--	–
West End Street Railway	....	....	....	....	--	–
Louisville, Ky.—Aug 6.						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry...................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Aug 6						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅝	68½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct.	186	187
Montreal, Canada.—Aug 6						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	3 % S., M. & N.	260	261
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—Aug 6:						
Memphis Street Railway Co.	100	500,000	500,000	....	25	–
New Haven, Conn.—Aug 6:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	–
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.—Aug 6						
Canal & Claiborne RR. Co.	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR...........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Aug 6:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	265	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	100	125
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	154¾	155
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	392	400
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	395	410
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	200	210
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	401
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	197	200
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¼
m 42d St., Manhatv'le & St. Nich. Av.	100	2,500,000	2,500,000	....	50	60
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Aug 6:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57½	60
North Jersey Railway Co.	100	6,000,000	6,000,000	....	26	26¾
United Elec. Co. of New Jersey..	100	504,000	504,000	11¼ % A.	19½	20
Pittsburg, Pa.—Aug 6:						
Allegheny Traction Co.	50	500,000	500,000	....	55	56
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	24½	24¾
Consolidated Traction Co.......pfd.	50	9,478,850	9,000,000	3 %, Nov.	63½	64½
p Central Traction Co.	50	1,500,000	|900,000	1½ % Nov.	69	70
q Citizens' Traction Co.	50	3,000,000	‡3,000,000	6 % A.	72½	72½
r Duquesne Traction Co.	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	|2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co.............com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co.............pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. | Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass– Aug 6						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass– Aug 6						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.– Aug 6:						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.– Aug 6:						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.– Aug 6 :						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.– Aug 6						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount	50	1,966,100	ǀ1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000 000	29,980,450	....	35	8 ¼
*c*Electric Traction Co	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	ǀ1,875,000	$14 sha'e A—Apr.'99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A. Mar. 98	300	...
*e*People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	ǀ572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	ǀ150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	ǀ740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	ǀ277,402	....	...	...
*b*Philadelphia Traction Co	50	30,000,000	ǀ20,000,000	$2 p. sh., Oct. 98.	96	98¼
*j*Catherine & Bainbridge St	50	....	ǀ400,000	6 % A—Mar., '98.	...	..
*i*Continental Pass. Ry.....guar.	50	1,000,000	ǀ580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	ǀ600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	ǀ475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	ǀ420,000	$12 share, July '98.	[illegible]	309
*j*Philadelphia & Darby Ry. guar.	50	....	ǀ200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	ǀ250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	ǀ335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	ǀ900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	ǀ750,000	$10 share, July '98	262	268
Rochester, N. Y.– Aug 6						
Rochester Railway Co	100	5,000,000	5,000,000	....	14	14¼
Reading, Pa.– Aug 6						
j Reading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	850,000	850,000	Jan., '98.	188	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.– Aug 6						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	..
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.....com.	50	500,000	500,000	....	20¼	21
United Electric Ry.....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	67	67½
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99	..	..
San Francisco, Cal.– Aug						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63¼
Presidio & Ferries RR	100	1,000,000	550,000	....	..	16
Scranton Pa– Aug 6 :						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	36
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16¼	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	..	..
Springfield Ill.– Aug 6:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	..
Springfield O.– Aug 6						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.– Aug 6 :						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.– Aug 6:						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ǂ	97¼	97⅜
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.– Aug 6:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	102⅝	102¾
Columbia Ry. Co	50	400,000	400,000	6 % A.	-	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	15	16
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	..	..
Worcester, Mass.– Aug 6:						
*Worcester Traction Co.....com.	100	8,000,000	8,000,000	....	29¼	31
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb., '98.	105	105
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.– Aug 6						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1 %, Jan..	25	29

* Unlisted. † Paid in. ‡ Full paid. ǀ Outstanding. ǂ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston. Mass.– Aug 6						
American B. T. Tel Co	100	50,000,000	28,650,300	4½ % Q., Jan.	143¼	144
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	97
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	183	185
New York.– Aug 6						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	104	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	115	117
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co	100	5,000,000	3,728,000	2½ % Q., Jan., '99.	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	110	1 5
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79¾	79⅞
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.– Aug 6 :						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co	100	......	......	....	61	65
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co	50	.... .	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.– Aug 6:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	....	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	131½	132
T.-H. Elec. Co..T. Secur., Series D.	..	......	......	....	77	77½
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	68
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44	44½
New York.– Aug :						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,968,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co....com.	..	......	......	....	82	92
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900.	151½	132
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
ǀ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa– Aug 6						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	800,000	800,000	Q	--	--
Philadelphia, Pa.– Aug 6						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	80
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	80	85
Northern Elec. Light & Power Co	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co	10	187,500	187,500	....	30	--
Miscellaneous.– Aug 6						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	150	160
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¼	92
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2 % Q ‡	201	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	131	132¾
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 98.	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

ǀ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.– Aug 6:						
American Electric Heating Co	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 26, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.– Aug 6 :						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co....com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co....pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.– Aug 6						
Electro Pneumatic Trans. Co	10	1,500,000	......	--	[illegible]	2⅞
United Gas Improvement Co..scrip.	50	10,000,000	......	--	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	--	21½	21½
Welsbach Commercial Co.....pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	48	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1½
Pittsburg, Pa.– Aug 6						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	90	192
Miscellaneous.– Aug 6						
*Barney & Smith Car Co.....com.	100	......	1,000,000	--	14	16
*Barney & Smith Car Co.....pfd.	100	......	2,500,000	2 %	90	83
Billings & Spencer Co	25	......	....	....	82	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	56	58
Johns-Pratt Co	100	....	....	--	105	109
*Pratt & Whitney Co.....com.	100	......	....	--	2	4
*Pratt & Whitney Co.....pfd	100	....	......	--	40	50
Stillwell-Bierce Co.....com.	..	....	....	--	--	50
Stillwell-Bierce Co.....pfd.	..	....	....	2 % Sept 1, '99.	70	65
Shultz Belting Co	100	500,000	....	....	80	90
St. Charles Car Co		....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	*118½	119⅛
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*117	......
‡Watervliet Turnpike & RR.1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‖Watervliet Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*123	127
Troy City Railway Co....................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co.No. Balto div.1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Aug 9, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‖W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
'Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	300,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s.	$150,000	‡$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	350,000	350,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123½
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,035,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Aug 6, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	—
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	—

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	367,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col. tr. 4s	29,735,000	29,724,876	1945	A. & O.	—	......
West End Passenger Ry.......1st mtg. 7s	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Aug 6 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,000,000	1934	J. & D.	......	..
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	...

Providence R. I.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Aug 6, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s.	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter..1st	1 000 000	000 000	191	J& J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—Aug 6, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.......................1st mtg. 5s	1,500,000	1,500.000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99⅛	100⅛
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100⅛
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117*
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117*
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	3,000,000	3,000,000	1918	J. & J.	126⅛	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126⅛	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105⅛	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*—Aug 6, 1900						
Belt Ry. Co.........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry...........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 6, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	......
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅜
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119⅛
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.).Cons.mtg. 5s	3,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105⅛	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Aug 6 1900						
Delaware Gas Lt. Co.,..........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—Aug 6, 1900						
Allegheny County Light Co................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Aug 6 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102⅛	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 6, 1900					100⅛	101
American Bell Telephone.....................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co..................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 6, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co..............	....	....	......	....	......	25
Barney & Smith Car Co......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¼@16⅜c.; Lake, 16⅜@16½c.; casting, 16@16⅛c.

The Chicago Union Traction Company's earnings in July were $630,892, a decrease of $22,918.

The report that Mr. J. B. McCall would resign the presidency of the Philadelphia Electric Company is denied.

Advices from Columbus, O., state that the Germantown Traction Company has increased its capital from $10,000 to $150,000, and the Cincinnati Street Railroad from $18,000,000 to $20,000,000.

President Vreeland of the Metropolitan Street Railway Company of New York says that the extension of the service over the Third Avenue tracks to Fort George had not affected the receipts of the latter road to any appreciable extent.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 16@18; New York Electric Vehicle Transportation, 7@8; New England Transportation, 4@4½; Gramophone, 35@40.

The Metropolitan Street Railway Company of New York has been authorized by the State Board of Railroad Commissioners to issue $7,000,000 new stock, which will be used in changing the motive power on a number of its lines.

President Gordon Abbott of the Massachusetts General Electric Company, of which the Lowell & Suburban is now a part, reports that for the year ending with June 30 the gross earnings of the roads, exclusive of the Lowell & Suburban, were $3,102,518.

The Railroad Commissioners of Massachusetts have authorized the Northampton & Amherst Street Railway Company to issue $60,000 five per cent. 20 year additional bonds for funding floating debt and to meet cost of abolition of grade crossings.

The New York State Railroad Commission is considering the application of the New York & Brooklyn Transportation Company and the New York, Brooklyn & Jersey City Rapid Transit Company for permission to construct a $30,000,000 tunnel under the East River.

At a meeting of directors of the Lowell (Mass.) Electric Light Company it was voted to increase the capital stock of the corporation from $300,000 to $400,000 and to offer $100,000 of new stock to the stockholders of record May 23, 1900, at par, subscriptions to be paid September 1.

A meeting of the stockholders of the Syracuse & Oneida Lake Electric Railway Company, Syracuse, N. Y., will be held August 21 for the purpose of voting on a proposition to increase the capital stock of the company from $300,000 to $1,200,000, to consist of 12,000 shares of the par value of $100 each.

The South Shore & Boston Railway Company has been authorized to issue additional capital stock to the amount of $175,000. Of this amount $100,000 goes for payment and capitalization of floating indebtedness, $20,000 for additional car equipment and $55,000 for additional electric overhead equipment.

The Twin City Rapid Transit Company has declared a dividend of 1½ per cent. on its common stock, payable August 15. Books close August 9 and reopen August 16. The company in August, 1899, paid a dividend on its common stock of 1 per cent., and in February last it paid a dividend of 1½ per cent.

The Minneapolis General Electric Company reports June gross earnings of $29,675, compared with earnings of $18,299 in June, 1899. The addition to the company's water power plant will shortly be completed, and the increase in water power capacity is expected to produce a material decrease in operating expenses.

The Massachusetts Railroad Commissioners have authorized the purchase of the Providence & Taunton Street Railway by the Taunton Street Railway Company. The board has also authorized an increased issue of $175,000 capital stock by the Taunton Street Railway Company for the exchange of shares of the Providence & Taunton Street Railway Company on a basis of share for share.

The stockholders of the Electric Storage Battery Company of Philadelphia, at their special meeting on August 1, ratified the resolution that passed recently to amend the certificate of incorporation to entitle the company to take advantage of a more liberal law of New Jersey. For the six months ended June 30 the earnings of the company were $1,400,000, compared with but $525,000 the same period last year, a gain of $875,000.

The Electric Storage Company of Philadelphia on August 4, under protest, paid the State of New Jersey $3,600 as a fee for filing amended articles of incorporation. When the company was originally incorporated with a capital of $18,000,000 a fee of $3,600 was paid, and the officers of the company claim that no charge should have been made for the filing of the amended articles. It is probable that the case will be carried to the courts.

The annual meeting of the Boston Electric Light Company is called for August 14. The annual report for the year ended June 30, to be submitted, will show gross earnings of $990,797, against $910,892 last year; net earnings for stock of $367,511, against $252,397 last year, and a surplus above dividends of $182,787, which compares with $108,489 in 1899. This surplus is increased by $253,294, as premium on stock sold.

The Western Union Telegraph Company finds the high price of copper a serious bar to the reduction in expenses which officers of the company hoped to be able to make. It has been apparent to the management for a good while that improvement in the position of the company must come largely through any reduced expenditure, but there has been one obstacle after the other in the way of obtaining this result. One has been the necessity of replacing a great amount of old wire with new copper wire. Another has been the constant demand for extensions, and, in the last year, the increased cost of materials has been added to other requirements. The difficulty in having profits increase in proportion to the increase in the volume of business is strikingly shown by a comparison of results. For the year ended June 30, 1867, the Western Union sent 5,879,282 messages. The receipts of the company were $6,568,925 and the profits $2,624 919. For the year ended June 30, 1899, the company sent 61,398,157 messages. Its receipts were $23,954 312 and its profits $5,868,732. A ten-fold increase in the number of messages brought less than a four-fold increase in receipts and only a little more than doubled the profits.

The New York "Commercial" says: "According to many of the bondholders the plan of the General Electric Company for the retirement of its outstanding 5 per cent. debenture bonds is not as successful as was expected, owing to the price at which the stock is selling. The exchange is to be made on a basis of 120 bonds for 100 shares of stock. At the present quotations the bondholders would be out upward of $900 on every 20 shares turned in, calculating on a basis of market value. According to reports from Boston the transfer is progressing slowly. Bondholders say that 140 for the stock alone will induce them to make the exchange. Regarding the proposed plan for the retirement of the bonds of the General Electric Company a stockholder is quoted as follows: 'The exchange is optional with the bondholders, and they would be foolish to surrender their holdings at the present quotations of the stock and bonds of the company. It is very much of a question in my mind whether or not debenture bonds on a 5 per cent. basis are not preferable to common stock on a 6 per cent. basis, subject to such fluctuations as it has undergone in the last year. It is not certain the stock will remain at 130, and then the company may not be able to maintain the present dividend rate of 6 per cent.'"

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ELECTRICITY.

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EDITORIAL NOTES.

The Coming Electrical Congress at Paris.

The International Electrical Congress, which is to be held at Paris, will meet at 10 A. M. on Saturday next, at the Congress Hall, near the Alma Bridge, in the Exposition grounds. Later meetings will be held at the well-known scientific headquarters, 44 Rue de Rennes. A long programme has been sketched out, covering every topic of interest to electrical engineers and physicists.

As stated some time ago in ELECTRICITY there will be five separate sections in which the following subjects will be discussed: "Scientific Processes and Measuring Instruments," "Production of Electrical Energy," "Electro-Chemistry," "Telegraphy and Telephony," and "Electro-Physiology." These general heads will be subdivided into numerous topics of vital interest to the electrical fraternity.

The Congress will last a week, which should ensure a thorough discussion of the papers presented. The results will be watched with interest by persons connected with the electrical industry the world over.

* * *

The Third-Rail.

The so-called third-rail system of electrical train propulsion has in many instances of late taken the place of the overhead trolley in localities where the erecting of an overhead conductor would prove impracticable, or where, as in sparsely settled districts, long uninterrupted runs at a comparatively high rate of speed are desired. This practice of drawing current from a rail laid along the track unquestionably has electrical and mechanical advantages to recommend it, but, on the other hand, the very many accidents which this system is responsible for indicate that the system is not an ideal one and that precautions should be taken to protect human life. This is forcibly brought out in the fact that scarcely a week passes but what injuries of a more or less serious nature to pedestrians are reported, and only last week a boy lost his life in an accident of this nature in Brooklyn.

That the third-rail has now come to be a necessity there is little doubt, and such being the case it would seem as though some inexpensive scheme could be devised for, if not entirely removing danger from it, at least reducing the chances of an accident to a minimum.

Where a third-rail is laid on an elevated structure, such for instance as that of the Manhattan Railroad Company of this city, it would seem as though with the exercise of a little ingenuity the rail might be placed below the ties in such a way that the shoe of a plough would bear "up" against it and not down on it. This arrangement would undoubtedly entail considerable extra expense, but would on the other hand make an accident through short circuit impossible.

Where an electric surface road makes use of the third-rail of course the above arrangement would be out of the question, unless the company saw fit to go to the expense of building a conduit, which, on a long stretch of track running through a sparsely settled community, could hardly be expected of it. Under these circumstances a company should at least adopt the precaution taken by the Baltimore & Ohio Railroad Company on its new third-rail system through the Belt Line tunnel, by encasing the third-rail between two planks set on edge, the top edge of the planks extending an inch or so above the rail. This arrangement would not entail a large expenditure of money, but would be the means of preventing accidents.

That some such scheme will ultimately have to be adopted on third-rail roads is evident, as public sentiment will demand it.

* * *

Electricity from Heat.

A few months ago we referred in these columns to the fact that a number of inventors were at work trying to devise an efficient thermopile, and also called attention to an invention in this line just then patented. We now hear of two new devices of this nature—one brought out in Germany, the other patented by a resident of Memphis, Tenn. In the German machine the couples are made of iron and nickel firmly brazed together. They are arranged, according to reports, like the windings of an ordinary electric motor, with one set of junctions brought conveniently to the surface where gas jets play upon them. The other set is cooled by a rapid circulation of air, engendered by a rotation of the machine. This thermopile, it is stated, is as yet not perfected and of little or no practical value.

The thermopile of the Memphis inventor, from the somewhat meagre information at hand, resembles to a certain extent the Cox

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thermopile (described in the issue of ELECTRICITY of May 9, 1900), except that the rings are wound with wire made of a secret alloy. The Cox pile, as will be recalled, consists of a series of castings, composed of antimony and zinc, connected by thin strips of copper.

The Memphis inventor appears to be extremely optimistic and claims that he can build a thermopile capable of generating forty horse power. On the other hand, he acknowledges in an interview that so far he has only succeeded in producing a generator capable of developing five watts, with which a bell may be rung and a small fan operated. In other words, this new thermo-electric generator is apparently capable of accomplishing no more than the old Cox generator could several years ago. The inventor says:

"My theory is that the electric currents of the earth are caused by the conglomerate metals in its crust becoming heated. After years of experimental work I hit upon a peculiar alloy, which is, in my belief, the same in effect as the combined minerals of the earth. By the use of this alloy, and by employing platinoid wire in winding my generator rings, I get, when they are heated, electricity."

It is to be feared that owing to the high price of platinum wire, machines of this type will not be in great demand even though, as the inventor claims, they will convert 80 per cent of energy from 100 per cent. of energy in the coal used.

* * *

Can the Energy Lost in Resistance be Utilized?

That there is an immense amount of energy which might possibly be converted into useful work that goes to waste through resistance and friction in the mechanical world is undeniable. As an example the steam engine may be cited, which, as is generally known, converts but about .005 per cent. of the energy of the coal burned in operating it into work. Numerous other examples could be mentioned, such as the friction of shafting in factories, where frequently 30 per cent. of power is lost in friction, while in electrical undertakings an immense amount of power is taken up by useless resistance in wires. Referring to the latter a writer in a recent issue of "Elektrotechnischer Auzerger" of Berlin, discusses the question as to whether the energy lost in regulating the resistances of motors and steadying resistance of arc lamps cannot be usefully employed. In the case of resistances such as those in series with fan motors, which are often kept running for a considerable period at less than their full speed, he suggests that low voltage lamps might take the place of the resistance coils, these lamps being in situations where momentary extinctions would not be of great importance. At the points where these lamps are he proposes to place a second lamp fed by the full pressure of the mains, and the regulating switch of the motor is to be so arranged that as soon as the low voltage lamps (serving as resistance) were switched out, the ordinary voltage lamps would be switched in, the contacts of this switch being placed so that the two lamps could not be alight at once. In the case of arc lamps, he suggests the use of cooking or heating apparatus having the same resistance as the steadying resistance, which could be switched on in place of the latter when required for use. He also proposes that fan motors and similar motors might be used in the same way. Arc lamp circuits and even incandescent lamps might be used for the same purpose where an unsteady light is permissible. This latter suggestion, says the London "Electrician," commenting on the article, hardly appears practicable, as the life of the lamps would be considerably shortened by the over-running occasioned by the carbons of the arc coming too near together, for even a relay to put in a substitutional resistance would hardly work to prevent this.

This subject of utilizing useless resistance is a most interesting one, and should certainly be worthy of a careful and systematic investigation. In this connection it might also be pointed out that an immense amount of power is wasted through friction in stopping railway trains and heavy trolley cars by the application of the brake shoes to the wheels. Could this wasted energy lost in heat be in some way saved it would go far toward making up for the large excess of current required to start a heavy trolley car from rest. It is to be hoped this subject may also receive the attention of some enterprising investigator.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

REGARDING the electrical treatment for tuberculosis devised by Dr. C. C. Carroll of this city, and referred to editorially in last week's issue of ELECTRICITY, there would seem to be some doubts of its efficacy, as one of the patients recently treated, and alleged to be cured, denies emphatically in a letter to the N. Y. "Herald" that he ever had tuberculosis.

THOMAS HENSON, of Pittsburg, Pa., is in Monterey, Mexico, negotiating for the purchase of the two street railway systems of Monterey in behalf of an American syndicate. If the deal is consummated, the systems will, it is stated, be consolidated and converted into an electric line.

The Manhattan Railway Company of New York has filed plans for three electric power stations to be located on the east side of the city.

NEWS from London states that the town council of Southend, Essex, has accepted the tender of a Philadelphia and London firm to build electric tramways at a contract price of £87,500.

LAST Saturday President H. H. Vreeland of the Metropolitan Street Railway Company of New York gave a large delegation of employes their annual clambake and outing. The employes left the Grand Central Station shortly after 9 o'clock in the morning for Brewster, where the Vreelands have a country home. Prominent citizens met the guests at the station. Carriages were in waiting and they were driven to Lake Tonetta to the house of the Tonetta Outing Club, of which Mr. Vreeland is a member. A concert was given by the Brewster Band, and shortly after 1 o'clock it was announced that the Rhode Island clambake, which had been under preparation, was ready. The party, after partaking of the bake, spent some time in fishing, when they again took carriages and were driven to Rest-a-While, the Vreelands' country home. They were warmly received by Mrs. Vreeland, who was assisted by some leading society women of the village. President Vreeland made an address of welcome, speaking of the support the employes had always given him. Then there were responses assuring him that he was held in the utmost esteem by the employes. Luncheon was served, the party returning by special train.

A REPORT from Middletown, Conn., confirms the statement that William Gray has invented a button attachment for the slides in the coin receivers at the branch telephone pay stations. It is designed to prevent mistakes by subscribers in placing coins in the wrong slot when calling up a number. At present users of telephones at public pay stations often place money in the wrong division, which fails to ring the signal at the central station. Mr. Gray has been working over this difficulty for some time and has patented his idea, which he thinks will obviate the trouble experienced by subscribers heretofore.

DURING the recent flower parade connected with the Street Fair in Joplin, Mo., automobiles, tallyhos, carriages, several sedan chairs and other conveyances were handsomely decorated with flowers of all kinds and colors.

THE laying of the first telegraph cable to connect the United States directly with Germany was started Saturday morning from the Commercial Cable Company's station on Coney Island. It will make the second cable connection between this country and the Azores, and will be the most direct telegraphic line to the European Continent. The cable is approximately 2,400 miles in length. It will connect at Horta, Fayal, with the German-Atlantic Telegraph Company's cable, which was recently completed from Horta to Emden, in Germany, and is already in operation. The cable will be worked in New York by the Commercial Cable Co., at Horta by the German Atlantic Telegraph Cable Co., and at Emden by the German telegraph administration, all telegraph lines in Germany being under the direction of the Government. The cable will be put down by the cable ship Anglia, which is said to be the most perfect vessel of her kind ever built. It is expected that the cable will be ready for the transmission of messages soon after September 1. The cost will be about $5,000,000.

PROMINENT business men of Henrietta, Tex. have lately made application for a charter authorizing them to do business under the name of the Henrietta Gin & Light Company. They will erect a modern gin at once to be ready for business by September 1. The purpose is not to make money out of the enterprise but to gin cotton and furnish electric lights at the lowest possible cost for farmers and citizens.

THE fire-alarm telegraph of the Fire Department of this city recently installed a new transmitter, costing $5,300. It will be used for sending out fire alarms, and will operate automatically. Under the old system there were three different instruments requiring three operators. The new instrument needs only one operator, and will do the work of the three instruments.

ELECTRICITY is finding extensive employment both for lighting and power purposes upon some of the newer ships of the German navy. In proof of this, says the London "Electrical Engineer," it will suffice to instance the

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Fürst Bismark, which possesses, perhaps, the largest electrical installation of any war vessel in the world. The vessel in question, it may be mentioned, is an armored cruiser displacing some 10,608 tons. Her electrical equipment comprises five compound-wound steam dynamos, each having an output of 590 amperes at a terminal potential of 110 volts. The electromotors on board number 43, while five 40,000 c. p. searchlights are installed, besides about 1,000 incandescent lamps. In addition to the interior lighting of the ship, and for the telegraph, signaling and searchlight apparatus, etc., electrical energy serves for working the numerous ventilators, ammunition hoists, gun turrets, steering gear and boat hoists.

THE Mexico City lighting service comprises 481 electric street lights of 2,000 candle power, 366 of 1,200 candle power and about 150 incandescent lights of 16 and 50 candle power. The cost of the service per month is about $24,000.

THE Ganz system for working electric railways by means of multiphase current has been successfully experimented with in Budapest, Hungary. The system is now to be tried experimentally on the Valtelina stretch of the Italian State Railways. The length of this section of the line is about 65 miles, but we are not sure how much of it is to be equipped for the experiment.

THE Convention of the Association of Edison Illuminating Companies will be held at Saratoga September 4, 5 and 6. Headquarters will be at the Grand Union Hotel. About one hundred delegates are expected to be present.

A DISPATCH from Copenhagen states that the Great Northern Telegraph Company says that the war ships of the allies at Taku were communicated with recently over the new Chefoo-Taku cable. The new cable between Chefoo and Port Arthur will be ready for use within a week, and those between Chefoo and Wei-Hai-Wei, and Chefoo and Shanghai in a month's time.

PERMISSION has been granted the New York Electric Vehicle & Transportation Company—the old Fifth avenue stage line—to change its motive power and to extend its route. The extensions are from 89th street and Fifth avenue, up Fifth avenue to Mount Morris Park, west around the park by 120th and 124th streets to Fifth avenue again, and up to 135th street; from 89th street and Fifth avenue to 110th street, to Cathedral Parkway, to Riverside Drive, and from 57th street and Fifth avenue west to Broadway, and up Broadway, crossing the Grand Circle to West 72 street, to Riverside Drive, to 124th street.

THIS fall will see the cessation of the mail car service in this city. The Metropolitan Street Railway Company, which controls by stock ownership the Third Avenue Railroad Company, has decided not to renew the contract the latter corporation had with the Post Office Department at Washington for the last five years to carry mail bags over the system. Present indications are that the old method of transporting the mail uptown on the Third avenue elevated road will come into practice once more. The contract for carrying the mail went into effect in the latter part of October, 1895, to run five years, so that it will expire in less than three months. According to the present system the the Third avenue maintains a service between the General Postoffice (over its surface car route by way of Third avenue, 125th street and Amsterdam avenue) and the branch postoffice at 157th street and Amsterdam avenue. President Vreeland, of the Metropolitan Street Railway Company, admitted recently that his company had decided not to renew the contract, but was reticent as to the reasons for the decision. It is understood, however, that the risks incident to the carrying of the mails have made it a transaction which does not pay, in view of the moderate compensation. This is said to be because the use of mail cars means an increase in accidents. These cars are hitched as "trailers" behind the regular passenger cars, and people who stepped from the latter have been caught occasionally between the passenger and mail cars.

A CABLE dispatch from Paris states that seven balloons left the Parc d'Aerostation at Vincennes recently, competing for the prize offered by the Exposition.

A LONDON contemporary states that the German Government is testing the value of certain improvements in telephones, and the Bank of Darmstadt has now been entrusted with the floating of the novelties. It is claimed that the spoken message can be recorded in such fashion as to be reproducible as often as required; and that one wire under the new system can be used simultaneously by several persons. The sound is also strengthened, so as to make long-distance work easier, and a message can be transmitted simultaneously to various points.

THE street railway lines in Moscow, Russia, are about to be extended, and will reach a total of 84 miles. It has been decided at the same time to change the present system of horse traction for the electric trolley system over the greater part of the lines, while the remainder will be operated on the surface-contact system and by storage batteries. The cars will travel at a speed of 12½ miles an hour. The time limit allowed for the conversion of the lines from horse to electric traction is four years.

The Navy Department has decided to establish an electric equipment plant at the Portsmouth navy yard, and for this purpose $100,000 has been appropriated. An officer has been detailed to the local yard to study the methods and system. The establishment of that plant may seriously effect the local navy yard in regard to work. At the present time the work in this department at the local yard is slack. The local equipment plant has been converted into an extensive manufacturing establishment. It practically manufactures all the electrical equipment necessary for the navy. When the plant at Portsmouth is running it is expected that a large amount of work will be taken away from the local yard.

REPRESENTATIVES of the Gould Storage Battery Company, of New York, and the Electric Storage Battery Company, of Philadelphia, are making severe tests of their storage batteries under the supervision of the officials of the Cincinnati Street Railway Company to ascertain which will stand the greater strain. Each has five cells of batteries at work, which they are charging and discharging by running current into them. The switch is then thrown, and the current is allowed to escape through running water. In this way the most powerful battery will show up best, and the street car company will select the one giving the best service.

The Theory of the Coherer.

Messrs. K. E. Guthe and A. Trowbridge contribute a valuable article on the above subject to the July number of the "Physical Review." After giving a brief résumé of work done by other experimenters and also of past theories on the subject, the authors proceed to describe their own original investigations and to analyze them by means of curves. Their conclusions on the subject, in which they attribute the high original resistance of the coherer to the film on the surface of the metallic particles, are as follows: "Dorn has shown that very little or no coherer action takes place between surfaces of the noble metals when they have been heated in a vacuum so as to expel as far as possible the surface film. He also found a decided decrease of resistance for other metals. Aschkinass, on the other hand, tried to remove the surface film from the filing particles in a tube by exhausting and heating, but did not observe any change in the behavior of the coherer. He admits himself, however, that this can hardly be considered a decisive test.

"The fact mentioned above, that metallic surfaces after thorough cleaning do not show high contact resistance, is also in favor of our supposition, and we believe that Auerbach's results can easily be explained by the rubbing away of the films by mechanical action. The films must form a sort of protecting layer on the metal surface, as the following experiment shows: Two coherers, consisting of one contact each, were put in parallel and the circuit closed through them. The resistance of each was measured before and after lowering, and it was found that coherer action took place in one only. After standing a day this one was always oxidized, while the other showed a bright surface where the balls had been in contact. The coherer action had apparently destroyed the protecting film of the one in which it took place.

Aschkinass mentions his interesting results with coherers consisting of PbO_2 or CuS particles as a proof against Lodge's theory. They behave in the opposite way from the ordinary coherer. We would suggest, in view of the similarity with polarization, that the compounds are in this case broken up into two components, one of which conducts well and the other poorly. No actual metallic contact need then occur, and the S or O mould would play a decided rôle in the increase of the resistance. It seems that particles of any conducting substance may form a coherer—among others, carbon. This suggests an interesting question in connnection with the electric arc. Ayrton and Perry found that the difference of potential between the two carbons of an arc lamp was independent of the current strength, provided the distance between them was kept constant—i. e., the apparent resistance of the arc was inversely as the current. Does this correspond to the horizontal line of our curves, and does cohesion play any part in the starting of the arc? We offer the foregoing considerations merely as a tentative explanation of this little understood phenomenon, being well aware that some of our assumptions are somewhat crude, but hoping, nevertheless, that they may lead to a fuller understanding of the suject, since they seem to furnish a satisfactory hypothesis."—The "Electrical Engineer," London.

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THE GRAPHOPHONE GRAND.

[NOTE.—An exhaustive and ably written report on the merits of the "Graphophone Grand" was made to the Franklin Institute of Philadelphia by its Committee on Science and the Arts and is published herewith. The Institute adopted the report on January 3, 1900, and the document was printed in full in the July number of the "Journal of the Franklin Institute." The report is on the invention of Thos. H. McDonald of Bridgeport, Conn., and gives a general history of sound-recording and reproducing devices, and will undoubtedly prove of interest to readers of ELECTRICITY—ED.]

The Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts, acting through its Committee on Science and the Arts, investigating the merits of the "Graphophone Grand," reports as follows:

The subject-matter of this application is a method of recording and reproducing sound, invented by Thomas H. Macdonald of Bridgeport, Conn., and termed the "Graphophone Grand." This method, as stated by Mr. Philip Mauro, in his presentation of the subject before the Franklin Institute (March 15, 1899), and also in the patent specifications, is a modification of and improvement on the method patented by Bell and Tainter in 1886. A proper understanding of Mr. Macdonald's improvement, accordingly, entails a due consideration of the earlier invention, and, coincidently, a review of the prior art generally.

Talking machines have been the aim of numerous inventors at least since, if not before, the year 1779, when the Imperial Academy of St. Petersburg offered a prize for the construction of a machine which should be capable of producing the vowel sounds as expressed by the human voice. The prize was awarded to Prof. Kratzenstein, for his devices and investigations, which resulted in considerably widening the horizon of acoustic science, and presently thereafter the Abbé Mical in Paris (1783) and Von Kreinpelen in Vienna (1788) were working in the same field. Many ingenious mechanisms were constructed by these workers, and improved upon by various successors, of whom Faber of Vienna, about 1850, produced a very remarkable speech-articulating machine. In 1857, however, the attention of inventors was directed to a more promising field of effort, through the labors of Leon Scott, who patented the sound-recording machine known as the phonautograph, in which the principles of acoustic physics were employed to produce an autographic record of the human voice and of other compound sound vibrations.

The optical demonstration of rhythmic sound-waves dates back as far as 1787, when Ernst Chladni published at Leipzig his epoch-making discoveries in this field, but although these developments were amplified by the researches of Strehlke in 1825, of Young and Wheatstone in the following decade, and by those of Tyndall, Helmholtz, Melde and Lissaoux at subsequent periods, the graphic reproduction of vocal sounds appears to have been first effected by Scott's appliance. In that instrument the sonorous impulses produced by speech and other non-rhythmic tones were graphically recorded through the vibrations of a tympanum consisting of a flexible diaphragm, acting by means of a stylus on a revolving cylinder, and it is this sensitive tympanum and its attached stylus, developed and improved by successive inventors, that form the essential elements in the talking machines of to-day.

The phenomena demonstrated by Scott were analyzed in relation to vocal sounds, and especially with regard to the separate functions of the vocal organs, by the French Linguistic Society in 1875, and these studies, together with Bell's invention of the telephone in 1876, gave a new impetus to research in the direction of talking machines.

In the spring of 1877 the Paris Academy of Science appears to have received from M. Charles Cros a communication proposing the production of Scott's sound records in the form of tracings on a transparent surface, and the reproduction of these tracings by a photo-chemical etching process in the form of sunken lines on the record plate. In a retracing of the record these lines were to serve as guides to the stylus, and thus the vibrations of the diaphragm, and, coincidently, the corresponding sound-waves, were proposed to be reproduced. A method analogous to this, but avoiding the intervention of photography, and producing the record directly on a plane metallic surface, was subsequently developed in this country (*infra*), but Cros appears to have gone no further than to make the communication referred to, which was not published in the "Comptes Rendus" until some six months later, in September, 1877.

THE GRAPHOPHONE GRAND.

In the same year, however, the actual reproduction of sound tracings back into perceptible sounds was accomplished by Thomas A. Edison, through his invention of the sound-recording and reproducing device termed the "phonograph." In this instrument the movements of the vibrating diaphragm, which Scott had translated into the form of a sinuous line traced spirally around a cylinder, were reversed in their effect. Instead of the stylus being caused to move in a plane parallel with the surface of the revolving cylinder, it was made by Edison to indent the surface, and thus the sinuosities of Scott's line on an even plane were transformed into similar sinuosities of a line in a varying plane. This was done with a view to causing the stylus to retraverse the variously indented line, and thereby reproduce in the diaphragm the vibrations, and, coincidently, the original sounds which had caused the indentations, and this effect was indeed produced in the mechanism which Edison devised for the purpose.

The movement of the recording stylus being derived from the minute impulses of sound-waves acting on a membrane, Edison found it necessary, in order to produce an indentation sufficiently marked to serve the purpose of reproduction, to reduce to the utmost possible degree the resistance of the receiving material to the impact of the vibrating stylus. To this end a thin grooved line was cut in a spiral around the receiving cylinder, and over this was fastened a sheet of tin-foil. By a suitable screw attachment the cylinder was revolved so that the spiral groove beneath the tin-foil passed under and in touch with the vibrating stylus, and thus the tin-foil was made to receive the impact of the stylus where the hollow groove in the cylinder left the foil without support. The indentations produced in the tin-foil by the movement of the stylus were sufficiently positive and distinct to permit their translation into audible sound-waves. This was effected by causing the spiral line of indentation to repass before the stylus in contact with the latter, and thus to actuate the stylus as by a succession of cams and correspondingly to vibrate the diaphragm, which in turn transmitted its impulses to the surrounding air in the form of sound-waves corresponding to those which had produced the indentations originally. Edison's phonograph was thus the first strictly acoustic talking machine.

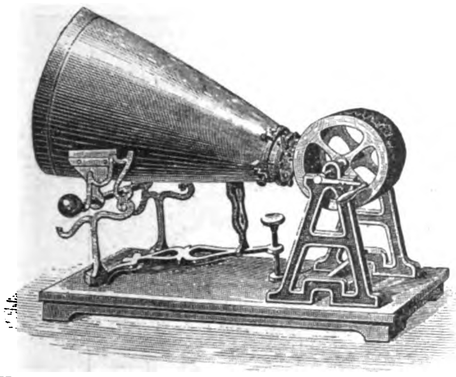
The very property, however, of the tin-foil, or of any similar material that afforded the possibility of its being sufficiently indented through the impulses of sound-waves, proved an insurmountable obstacle to its practical application for the purpose in view. A very few passages of the line of minute indentations in contact with the reproducing stylus sufficed to so far level down the spaces between the indentations as to practically obliterate the record, and though various means of giving permanence to the record were devised and put into practice, such as filling in with wax on the back, to stiffen it, or a reproduction of the surface by electrotyping, the technical difficulties encountered in these processes left the instrument unavailable for practical use.

Apart from various propositions to overcome this difficulty by causing a thin sheet of metal to vibrate in touch with a revolving cutting tool, in order to produce a sound record of durable quality, which does not, however, appear to have been actually attempted, the machinery of sound reproduction remained as Edison left it until 1886, when the efforts of Chichester A. Bell and Sumner Tainter, of Washington, D. C., afforded a solution of the problem. The advance effected by these two inventors consisted essentially in the substitution of a cutting edge for the indenting point of Edison's apparatus, and the coincident use of a material for their cylinders sufficiently cohesive to be practically available for reproduction and sufficiently amorphous to permit the cutting stylus to engrave its surface. The substance which was found to answer these requirements best is a compound of beeswax and paraffin, which in practice was imposed on the surface of a cylinder of pasteboard. The stylus, having to cut into the surface of the recording cylinder instead of indenting it, was accordingly fixed at an angle to the radius of the cylinder, instead of parallel with it, and being held by a light spring or weight, in contact with the revolving surface, while vibrating under the impulses of the sound-waves, the vibrations were recorded in the waxy material in the form of an engraved line whose depth varied in accordance with the vibrating movements of the cutting stylus. These cuttings gave at once a record deep enough for reproduction and rigid enough to permit the repas-

sage of the record in contact with the reproducing stylus a considerable number of times, without the successive elevations and depressions of the record being materially altered in their relations. In this regard the smoothness of the waxy ground afforded a material advantage. The positive nature of the engraved record, and the strength of the material in which it was made, afforded also the possibility of the records being mechanically duplicated on other cylinders by transmitting, through suitable connections, the motion of the recording stylus on the former to a cutter on the revolving surface of the latter.

Apart from the great advance effected by Messrs. Bell and Tainter in producing the sound records in a comparatively permanent and practicable form, they improved in many important respects the various mechanisms required in the process. Their apparatus, in distinction from Edison's "phonograph," was called the "graphophone."

This historical review of the progress of sound-recording and reproducing mechanisms brings us, at this point in chronological order, to the consideration of another device for the same purpose, already alluded to, and which also may be regarded as starting from the phonautograph of 1857, but which, continuing on the lines of that instrument to obtain the

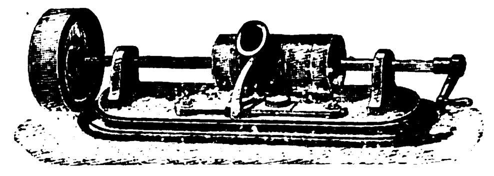


Leon Scott's Phonautograph.

record on a plane surface, diverged at this point and wrought this flat record into depressions by chemical means. These depressions, however, recorded the vibrations of the sound-receiving diaphragm in sinuosities of the side walls instead of sinuosities of the bottom of the lines. This was the so-called "gramophone," invented in 1887 by Emile Berliner, also a resident of Washington, D. C., and which was brought out before this Institute in May, 1888.

The principle of Berliner's procedure differs radically from those of his predecessors, inasmuch as his record, being effected by a stylus vibrating in a plane parallel with the receiving surface, is free from the disturbances resulting from a varying resistance to its movements. This latter factor enters inevitably into the result when a depression of any surface is effected by indentation or by cutting, the resistance naturally increasing with the depth of the depression to be produced, while the latter is directly related to the amplitude of the vibration which the depression is to record. Berliner's record was traced in the form of a spiral line on the surface of a disk of polished zinc, through a film of extreme tenuity, composed of a fatty acid obtained from a solution of wax. This film serves as a resistant to an etching mordant, which effects a depression of the traced line by erosion of the bared metallic surface, the etching then being ready for reproduction into sound-waves by reversing the procedure.

We now come to the latest innovation in acoustic mechanisms, the so-called "Graphophone Grand." This invention, as has already been noted, is a modification, by Mr. T. H. Macdonald, of the graphophone of Bell and Tainter. The improvement of the parent invention is effected (claim 1) "by imparting to

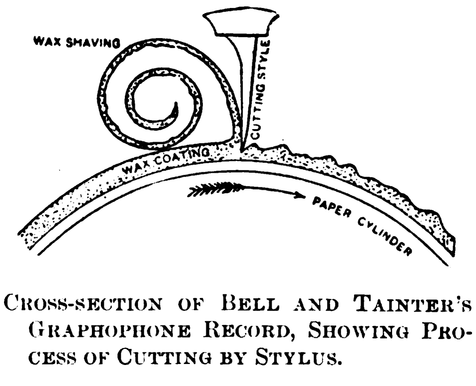


Edison's Phonograph.

the tablet a high surface speed, thereby forming undulations of great amplitude with long, gentle, easy strokes, as contradistinguished from a record of the same sound having short, abrupt undulations." Furthermore (claim 2) in the "placing of the vibratory cutting stylus in contact with a record tablet at an acute angle to the tangent at the point of contact.

With regard to these procedures, it appears that there is no difference between the graphophone record of Bell and Tainter and that of Mr. T. H. Macdonald, except "that the recording tablet of the 'Grand' moves with a surface velocity of from two and a half to three times that given to the small tablet. The former is made large because, for practical reasons, it is preferred to obtain the high surface speed by increasing the diameter of the tablet rather than by increasing its axial speed."

With reference to these practical reasons it is noted in Mr. Mauro's* presentation that "superficial considerations would indicate that such change in operation could only have the effect of producing a corresponding elongation of the undulations, and, in order to see a logical connection between the cause and effect, we must observe a little more closely the conditions under which records of sounds are made and reproduced." These conditions, it is stated, "may be roughly described as follows: The cutting stylus, performing its pendulous motion corresponding to the sound-waves, cuts a sinuous line composed of alternate elevations and depressions. As the cutting edge begins to descend to cut a depression, it at first encounters practically no resistance, the sharp edge alone being in contact with the material of the tablet; but, as the movement continues,



Cross-section of Bell and Tainter's Graphophone Record, Showing Process of Cutting by Stylus.

the crest just being formed by the descent of the cutting edge comes in contact with the shank of the cutting stylus, that is, the smooth cylindrical surface forming the periphery of the stylus. As soon as this occurs a check is imposed upon the further penetration of the stylus, which is no longer free to follow the movements of the atmospheric impulse. The effect of this check or damping influence is not merely to diminish the penetration of the stylus, but also to modify to some extent the form of the undulations.

"The effect of increasing the velocity of the recording tablet will now be easily understood. If that velocity be made sufficiently great, the crest of the undulations as they are formed are, so to speak, carried away so rapidly that they do not come into contact with the shank of the stylus at all. More exactly stated, the descending slope becomes a very gradual as distinguished from a very abrupt one, the curve approaching more nearly to parallelism with the recording surface. It follows that, the resistance or check being removed, the stylus will penetrate to a much greater depth than formerly, and will form undulations of much greater amplitude. The volume of sound being dependent upon the amplitude of the vibrations, the increased volume of sound is thus accounted for."

All this is quite true, but the utility of increasing the diameter of the cylinder to obtain the greater peripheral speed is not thereby made apparent. In a passage preceding the above quotation, it is noted that "when the speed is increased a proportionately greater amount of material is cut away in a given time, i. e., more work is done and more resistance overcome during the period occupied by the utterance of a given sound. It would appear to follow that increased velocity does not diminish the resistance to the movement of the stylus, but just the reverse. It is clear enough that greater peripheral speed is desirable to the end of making the indulations of the incision longer and correspondingly more gradual, but inasmuch as the length of the line and coincidently the extension of the undulations may be obtained on a smaller cylinder by increasing its peripheral speed, it appears certain that no gain in this respect is obtainable by the use of the larger cylinder. This conclusion is corroborated by a consideration of the element of resistance in relation to the angle of the cutting stylus to the tangent of the receiving cylinder. Immediately following the statement above quoted, Mr. Mauro notes as follows: "The factor of resistance, however, has had an influence in determining the angle of inclination of the stylus to the recording surface and the shape of the cutting point. The latter is formed by a small cylinder of sapphire cut off in a plane nearly at right angles to the axis, so that the cutting edge is approximately an arc of a circle. With such a cutter the resistance to its action would be greatest when it operates in a position normal to the recording surface, and least when placed tangential thereto. This theoretical position of least resistance is, however, inadmissible in the operation of recording sounds. In this operation we have two movements to consider. The first is the straight-ahead movement of the tablet which results nearly in the removal of the material in front of the cutting point and the formation of a groove. If the stylus were stationary during the operation it could, manifestly, and with great advantage, occupy a position almost tangential to the cylinder; but there is a second and all important movement, namely, that due to the vibrations of the diaphragm, which movement is substantially radial of the cylinder. It would be manifestly impossible for the stylus to perform this move-

* Read at the Stated Meeting of the Franklin Institute, March 15, 1899.

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ment at all if it occupied the ideal tangential position, for that would imply forcing the stylus sidewise into the hard body of the tablet, a task far beyond the strength of the feeble sound-waves. In practice, therefore, the stylus has been inclined at an angle of about 35 to the tangent at the point of contact."

Thus, it appears that the additional work imposed on the cutting stylus by the elongation of the line which it must cut is overcome by giving the cutting tool a sharper angle of incidence and possibly a sharper cutting edge. The added work entailed on the cutting stylus by the increased depth of the depression, obtained by freeing its shank from the back-hold of the preceding elevation, may be left out of account as being equivalent in work of the power lost on the back-hold. We have, therefore, to consider only the final element of the subject here presented, the position of the cutting stylus in relation to the tangent of the receiving cylinder.

It is plain (1) that the most efficient position of the cutting stylus would be in the tangential position; (2) that the smaller the diameter of the cylinder, the more nearly could the tool be brought to the tangential position without suffering the hold-back of the ridges in effecting the desired impressions.

Conversely, the highest position, that is, the largest angle of incidence required for freedom from back-hold, would be necessitated if a flat surface were to be incised by the tool, and inasmuch as the surface of a large cylinder offers more nearly the geometrical condition of a plane than that of a small cylinder, it follows that the efficiency of a cutting stylus, depending as it does on the acuteness of its angle of incidence, would be greater on a small than on a larger cylinder.

The possibility of obtaining a greater volume of sound by enlarging the characters of the sound record is noted by Berliner in the "Journal of the Franklin Institute" for June, 1888. Mr. Mauro's statement that "methodical experiments have shown that beyond a certain critical speed there is no gain either in loudness or quality, but that on the contrary, the results deteriorate upon further increase of velocity," is in line with the previous observations of Berliner (Technische Notizen, etc., Leipzig, July, 1890), where, with reference to sound records on horizontal surfaces, it is stated "that the wave amplitudes increase up to a certain peripheral speed. Up to the present time this limit is reached at a velocity of 60 centimeters per second." This is equivalent to 36 meters per minute, while Mr. Macdonald stated it as being approximately 44 meters.

The utility of increasing the peripheral speed of a cylinder in which a sound record is to be incised is apparent in the greater gradation of the undulations, and in the freedom from back-hold of the cutting stylus which these more gradual undulations afford. The embodiment of this utility in the Graphophone Grand is hereby recognized by the Franklin Institute, through the award to Mr. Thomas H. Macdonald of a Certificate of Merit.

In view, moreover, of the material advance effected by Messrs. Chichester A. Bell and Sumner Tainter in the development of sound-recording and reproducing mechanism, through their invention of the graphophone, the Franklin Institute recommends the award of the John Scott Legacy Premium and Medal to the said inventors jointly.

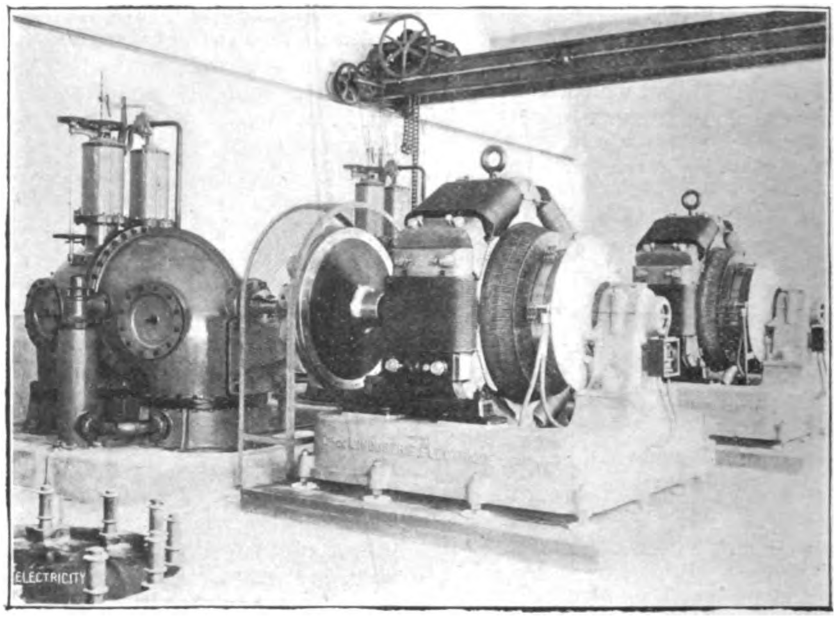
A HIGH TENSION DIRECT CURRENT POWER TRANSMISSION.

BY FRANK C. PERKINS.

The Association of the Communes of Val-de-Travers was formed between the districts of Noiraigue, Travers, Couvet and Fleurier, Switzerland, with a view to utilizing a water power on the Areuse River where it leaves Val-de-Travers.

The available fall was 29 meters with a volume of two cubic meters at low water, but this would not furnish sufficient power for the complete development of the electrical distribution planned for these villages.

Couvet had been lighted by gas and had discarded it. Fleurier alone had bought, developed and perfected a gas works and had not to rely solely upon electricity. It was therefore necessary to supply more current at times than the water available would furnish. The high tension direct current system was adopted as the best solution of the problem. At the power house three groups of generators were installed of 250 hp., furnishing a direct current at a potential of 2,600 volts each. The machines were wound for a constant current of 65 amperes and are seen in the accompanying illustration. The machines are operated in series at several thousand volts and each machine has its base carefully insulated and mounted on porcelain supports and is seen in the view.



D. C. Generator Power Plant at Val-de-Travers, Switzerland.

The line is 35 kilometers long and consists of conductors 10½ millimeters in diameter. At the receiving stations transformers and storage batteries are used, supplying the network village distribution with three wires at 125 volts potential. The power distributed consists of 130 hp. in motor, and the lighting consists of 6,400 incandescent and 6 arc lamps.

The building of the system of telegraphs that is to connect St. Michael with Nome and other points along the northwest Alaskan coast will soon be begun. At the same time the Canadian Government will be pushing their line from Dawson, down the Yukon, till it meets the United States line. These two lines, will extend through all the main mining districts and settlements and Government posts thus far established.

SOME NOTES ON INQUIRIES FOR ENGINES.*

BY J. A. SEAGER.

The following are a few suggestions for guidance in inquiring for an engine which will be found to obviate much unnecessary correspondence, and facilitate the delivery of a satisfactory steam unit. It is remarkable how many omissions can be made in a single inquiry, apparently due, not so much to carelessness, as to a misunderstanding of the requirements of the engine-builder. It would add greatly to the quality of the work done, besides cheapening the price and reducing the time of completion of work, if the requirements of the customer could be made to agree more closely with the standard practice of the engineers. The present notes are limited to main engines, such as those used for mill machinery, electric power plants, steamship propulsion, etc.

Horse-Power.—It seems almost unnecessary to say that the horse-power of the engine should be stated. The brake horse-power should preferably be specified. In arranging for belt or rope driving, as a percentage of power is lost in transmission, a 5 per cent. increase should be made to the calculated brake horse-power of the engine for short single drives, longer drives or multiple drives, of course, involving a greater percentage loss. It should be mentioned whether the driving is to be by rope pulley, belt pulley, or half-coupling for direct driving.

Steam Pressure.—I have seen a few engines from which the boiler pressure has been omitted, although it is obvious that an engine cannot give the same power with low as with high pressure steam. If no boiler has as yet been installed, the engine-makers should be asked to state the most suitable boiler pressure. If the boiler is already laid down, its working pressure, less the loss of pressure along the steam-pipes (which may be from 5 lbs. in short, well-designed lengths, to as much as 15 lbs. in long or crooked arrangements), should be stated in the inquiry.

Speed.—The question of speed has an important influence, not only on the size of the

* Paper read before the Students' Section of the Institution of Electrical Engineers, London.

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engine, but often on the type also. For example, high-speed-engines—i. e., from, say, 350 to 600 revolutions per minute—are now usually built vertical, and often with their cranks, connecting rods, valve motion, etc., enclosed. With slower speeds, however, horizontal engines with large cylinders and unenclosed mechanisms are employed, or in situations where ground space is begrudged (as on shipboard and valuable ground), these open-type engines are built vertically. It is not always possible to give the engine-maker much latitude as to speed at which he may run his engine, but wherever possible he should be allowed to select his own, or, at the very least, be given some slight range to choose from, in order that he may put in a standard, and, therefore, cheap size which will run economically.

CONDENSING.—Although an economy can be effected by the use of a condenser, an engine should not be changed over from an atmospheric exhaust to a condenser without one is sure that it is mechanically strong enough to stand the strains due to increased difference of pressure on the faces of the piston, and the greater mechanical force transmitted at the same speed. For this reason the engine-maker should always be informed whether a condenser is to be used or not. Two other reasons may be cited: The distributing valves would be set differently for the two conditions, and possibly a smaller engine could be put in if it were to run condensing. With large-sized engines it is often advisable to have a separate condensing plant for each engine, the pumps for which could either be worked by the main engine or by small auxiliary engines. It is preferable, however, to leave this point to the engine-maker's discretion.

DESCRIPTION OF SITE, ETC.—It would be disappointing if, after the engine was delivered, it was found to be too large in one of its dimensions for the space provided for it. The client should therefore either send a dimensioned sketch of his foundations, if supplied, or of the site, and also the height to roof, traveling crane, or other obstruction; or he should ask the engine-maker to send an outline drawing giving the main dimensions of the engine when tendering. If the engine is to be erected inside a building, it would be well to make sure that there is a door or other convenient opening large enough to admit the engine when it arrives. A description of the site should always be sent. For example, it is of interest to the engine-maker to know whether his engine is to be placed on board ship or on a concrete foundation, for in the latter case only will foundation bolts and plates be required. If the engine is to be erected by the engine people above or below ground level, this must be mentioned, as special lifting or lowering tackle would have to be provided. Details should be given as to the nature of the approach to the site—whether by land or water. In the former case it should be stated whether there is a road suitable for heavy traffic leading to the site; in the latter, whether there is a craneage wharf handy, and in both cases whether there is a traveling crane or other suitable means for handling the engine on site.

ERECTION.—In the matter of erection, however, the client has the choice of three alternatives: (a) giving the engine-maker the order to erect the plant complete on foundations to be supplied by the client if they are requisite, and giving the above information in full detail. (b) asking the engine-maker to quote only for skilled labor in erecting, the client himself providing all rough labor, cartage, etc.; (c) the client undertaking to erect the engine on site himself, in which case he should ask for quotations f.o.r. or f.o.b. at the nearest railway station or dock. The first method is the most costly, but usually ensures good work. The last is perhaps cheap, and the result may be good or bad according to circumstances. It should be understood that only under exceptional circumstances and by special arrangement will engine makers allow in their price for building foundations for the engines, or for any masonry, builder, or joiner's work required, or for any excavating, cutting away, or making good again. If such work is required, it must be definitely mentioned in the inquiry, and care should be taken to see that the engineer has bound himself to do the work.

COMBINED PLANTS.—For many purposes where small powers and high speeds are required, such as centrifugal pumps, fans, electric dynamos, etc., it is customary to supply a direct-coupled set mounted on a common bedplate, thereby cheapening the cost of erection. In such cases the engine-maker will supply the base-plate with his engine, and will, if requested, receive the apparatus to be fitted at his works, couple the same to his engine, and deliver the complete set ready for erection on the foundations. As a matter of fact, he will often undertake to supply the combined plant complete, fitting his engine to suit the needs of the fan or dynamo to be supplied on receiving particulars of the work to be done by the plant. This method of ordering is recommended to non-expert purchasers, as it saves trouble for the client, and throws the onus of failure or defect entirely on the engine-builder.

TOOLS, ACCESSORIES AND SPARES.—A clause should be included in the inquiry calling for all necessary tools, accessories and spares. A firm of good reputation will put in a suitable set without further information, but as a check the following items (though not forming a complete list) should be looked for—a complete set of spanners on rack, to be kept on rack except when being used on the engine, and any special tools required; spare springs and rings for pistons, and, if needed, valves; set of main brasses and smaller brasses; eccentric strap and governor springs if required; barring gear, tachometer, steam pressure and (if running condensing) vacuum gauges, etc. Cans, tanks, and filters for oil are not usually supplied by engine-makers. It should be specially stated whether steam and exhaust stop valves are required with the engine, or whether they will be supplied with the pipework. Engine-makers cannot be expected to connect their engine to steam, exhaust or drain pipes unless this was arranged before signing the order, and if connecting pipes or bends have to be placed between engine and main pipes, the position of the flanges on the latter with relation to the engine should be indicated when asking for a tender.

NATURE OF LOAD.—Different types of engines, equally high class in workmanship, are designed with varying intent. Some are meant to withstand severe shock, such as is experienced in rolling mills: others, such as are used in cotton mills and electric generating stations are required to give very uniform speeds under varying loads: others again, where fuel and water are expensive, are designed to give extremely low water consumption and high efficiency; still others, destined to be placed in populous localities or on slight foundations, necessitate a careful balancing of moving weights to reduce vibration. If any such special conditions exist they should be stated, so that the engineer may form an opinion as to whether heavy frame-work, Corliss valve gear, three-cranked shaft, etc., are applicable. It should be carefully stated whether the direction of rotation of the engine is to be reversible or not, unless the particulars given of the work to be done imply one or other of these conditions as essential. If the engine is always to turn in one direction, it should be clearly stated which direction would be preferable, as "the engine to run clockwise, or counter clockwise, as seen from the end of the crankshaft next the coupling or pulley."

STEAM CONSUMPTION AND EFFICIENCY.—Where steam consumption and efficiency are important, makers should be asked to state a guaranteed value for these in their tender at, say, full and half load. These values should be tested when the engine is built, either at the engine-maker's works or on site. In the former case the client is at liberty to see the tests carried out and verify the results himself; or he can have a signed certificate of tested results. In the former case it almost goes without saying the traveling expenses of the client are not included in the engine estimate, and it would be a breach of courtesy at least to claim from the engine-maker any sums spent in this way. If the tests are conducted on site, all fuel and water required for the test should be supplied by the client. It should be noted that the efficiency of an engine when new is generally some 5 per cent. less than when it has been running a short time, as the piston rings and bearings have not then come to a proper bearing surface.

SPEED REGULATION.—A point respecting speed regulation should be explained for the benefit of those who require very good governing. It is customary to test the action of the governor by suddenly throwing the full load off the engine, and expressing the increase in speed as a percentage of the original speed. This percentage will be guaranteed by the builder if required, and in good engines will not be above 3 per cent. But it is an instant or two before the governors will "get hold" of the engine after the load goes off, and the speed flies up possibly over 10 per cent. above normal. This excess of speed, though lasting only a short time (at most 10 seconds with good governors), would be sufficient to burn out a high-efficiency electric lamp if the engine were driving a dynamo, or break the threads in a spinning machine if the engine were running a mill. For this reason, the percentage of instantaneous, as well as permanent speed variation, should be asked for, if there is good reason for so doing.

TIME OF DELIVERY.—An engine-builder cannot keep a stock of engines, except possibly in small sizes, so that a period must be allowed him to complete his order. Since time is money, the client should ask in his inquiry for a guaranteed time of completion of work, which will obviate any misunderstanding as to what constitutes a reasonable time of delivery, and will enable him to discriminate between a maker whose shops are already too full of work and one who can supply the necessary power, labor and room to get the work through quickly. Such guarantees are, of course, given subject to delay due to strikes, lock-outs, accidents, or other causes not under the control of the engine-maker.

Although the above considerations by no means exhaust the points which have to be remembered in ordering an engine—it would

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be unfortunate for the consulting engineer if they did—yet if those mentioned were attended to, the confusion of ideas which is apparent in many inquiries would be lessened, and the chances of getting a satisfactory engine much increased.

SOME INTERESTING FAULTS ON TELEPHONE CIRCUITS.*

BY "BUSYBACK."

The presence of electric light mains near telephone circuits frequently causes disturbances in the latter, even though there is no actual contact or leakage between the two circuits.

On one of my visits to a certain small telephone exchange I was surprised to hear a most extraordinary noise on all the telephone lines. By listening on several of the lines, which were run in different directions, the neighborhood of the disturbing cause was

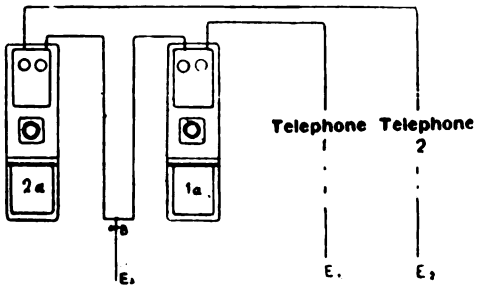

Fig. 1.

located by the increased loudness of the sound. On going to the place indicated, a man was seen drawing over the ground a peculiarly constructed piece of apparatus supported on wheels heavily insulated with rubber tires. Closely following this apparatus was another man carrying and listening at a telephone receiver in connection with the apparatus on wheels. At the central station there was a large induction coil sending a high potential alternating current into the cable. The whole of the proceedings were, of course, to locate the position of a fault in the electric light cable.

What struck me at the time as being remarkable was the fact that although the sound was loudest on lines which earthed near the fault in the light main, yet on lines which

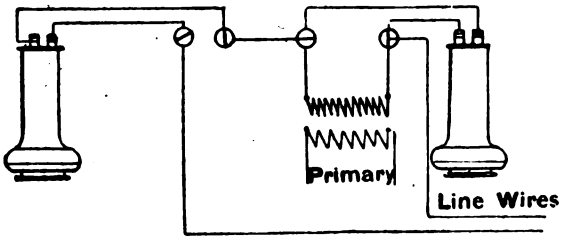

Fig. 2.

were earthed three or four miles on the opposite side of the exchange to the fault, there was sufficient noise to render conversation very difficult; on the lines which earthed near the fault the noise was so loud as to entirely prevent conversation.

Defective or unsuitable material will often cause a great deal of trouble; several instances could be quoted, but one must suffice.

On a certain telephone circuit difficulty was frequently experienced in calling the distant end and in conversing after attention had been obtained. Frequent tests did not reveal this difficulty for some time, as sufficient allowance was not made for a partial earth which was on the line at the time. The fault was eventually located in some underground wire; on this wire being taken up and examined, it was found that the copper had been reduced to a fine powder in several places, caused, no doubt, by some impurity in the ozokerite insulation. The effect of the wire being so reduced to powder was to increase the resistance of the line to such an extent at to shunt so much current to earth through the faulty insulation that sufficient did not reach the distant end to ring the bell.

On single line systems of telephones, faulty earth wires frequently cause overhearing and partial contact. The reason for this will be apparent if Fig. 1 is referred to.

When two or more telephones complete their circuit through one earth wire and any resistance is introduced in it, instead of all the current going to earth at E, a portion of it, depending on the resistance of the earth and of the instruments, will continue along the wire to the second telephone, and through it to earth again at the far end of line 2. If the resistance of the earth is sufficiently high all the bells will ring when one is rung; if it is not high enough only one bell will ring, but speaking will be overheard by any one listening on the other circuit.

A resistance in the earth wire may be caused by the wire being badly soldered to the earth plate or to the water pipe, thus allowing corrosion to set in between the pipe and the wire, or it may be due to the wire being broken at some point and a loose joint being made, which

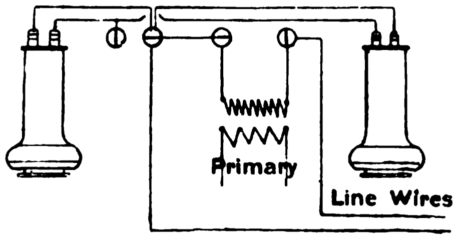

Fig. 3.

soon becomes of high resistance through the oxidation of the wire. In one case two telephones were put into intermittent contact by an ordinary bellhanger's joint being made in the earth wire, evidently by some person who had broken it and joined the pieces together, thinking them to belong to an ordinary bell.

If the water pipe to which the earth wire is soldered is fed from a cistern there will frequently be sufficient resistance introduced to cause difficulty, especially when the cistern is empty or the water is low, through there being no direct metallic connection between the main supply pipe and the pipe from the cistern.

Faulty connecting up of the various parts of an instrument will frequently give rise to peculiar faults. In one case, which has come under my notice, a second receiver was connected to an instrument, and there not being any special terminals on the instrument for this purpose, the receiver was connected in shunt with the induction coil secondary instead of in shunt with the first receiver. The effect of this was that messages could be received all right, but could only be transmitted very faintly, because the current which should have gone to line shunted through the second receiver. (See Fig. 2.) The longer the line the greater would be the proportion of the current circulating through the second receiver, and the smaller the quantity which would reach the instrument at the distant end of the line. The connections should have been as in Fig. 3.

An interesting fault, which caused considerable trouble, was the following: Complaint was made of there being a current on a certain telephone line when the instrument was in use. Several fruitless efforts to find the cause of this trouble were made, till on one occasion it was found that disconnecting the primary circuit also disconnected the secondary circuit. Careful examination showed that the primary and secondary circuits were connected in series as in Fig. 4, and not as they should have been as in Fig. 5. The effects of this careless con-

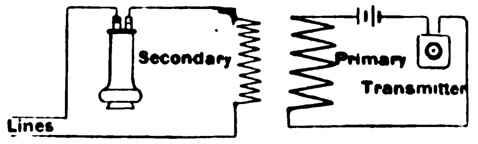

Fig. 4.

necting up were rather curious. While speaking, the current was sometimes strong enough to actuate the ring-off signal, and thus cause the attendant to disconnect the circuits when they should have been left connected. The speaking properties of the telephone were not interfered with to any appreciable extent; at any rate, no alterations of the speaking powers of the instrument were noticed on a short line.

Late one evening I was summoned to a certain fire station where there were a number of bells in the various firemen's rooms. These bells were all in parallel, and fed from one source of current. On my arrival at the station none of the bells would ring; as the source of current was in order, all the lines to the various bells were disconnected in turn, till at last the faulty circuit was disconnected, when the whole of the bells, with the exception of the one on the faulty circuit, rang. It being late, the faulty circuit was left disconnected with the remainder of the bells ringing as usual. Early the following morning the faulty circuit was tested and found to be in order, and the bell rang all right; also on connecting it to the main circuit, it, and all the other bells, rang as usual. On a thorough examination of the circuit which had caused all the trouble it was found that the fireman who inhabited the room in which this bell was fixed had been putting up some new window blind

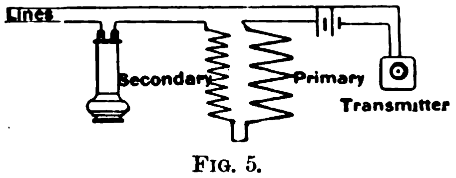

Fig. 5.

fittings: these had chafed through the insulation of the wires where they were brought through the window frame, and caused them to be short-circuited when the window blind was drawn down: thus the whole of the current passed through the short-circuit caused by the blind being drawn at night; consequently none of the bells rang. On the blind being drawn up in the morning the short-circuit was removed, and the bells rang as usual.

A very annoying fault is frequently caused by wires breaking under their coverings. This class of fault is so apt to be intermittent, and everything to be in apparently good working order while being examined. In testing for such faults a low battery power should be employed, not more than two or three cells, as a higher electromotive force is liable to break

*From the "Electrical Review," London.

the fault down and leave the circuit good until it is disturbed.

From the few examples given, it will be seen that telephone circuits are subject to many causes of interruption, especially as only the more interesting or more uncommon causes of interruption have been mentioned.

RATE METERS.*

BY HOWARD HENDRICKSON.

It is universally conceded that to arrive at the proper rate to charge for electric current, two main features are to be considered, viz., the fixed charges (interest and dividends on capital invested, depreciation and general expense account), and the variable charges, which may be called the generating and distributing cost.

The relative value of these two factors vary in every electric plant and with every consumer supplied.

To meet the commercial law that low rates are always conducive to largely increased consumption, and larger output insures reduced cost of production, it becomes imperative that a sliding scale be adopted in charging for current used to insure a universal profit on all customers.

Various devices have been suggested and used to determine what this rate should be in each individual case, notably maximum-demand meters. But these fail because a maximum-demand meter indicates the highest demand made on the station if but once in the whole period between readings; this will readily be seen is an injustice to the consumer if that maximum is used during the period and a charge based accordingly, as there is always one time during a period that a consumer would use more than ordinarily. For example, a contingency might arise during the first part of the period that would render it necessary for him to turn on all the lights in his establishment possibly for not more than thirty minutes; this would force the maximum-demand meter up to its highest point or capacity, there to remain no matter how small a quantity of power is thereafter consumed during the balance of the period; this is a constant source of trouble and dispute between the station and consumer and discourages the customer in freely using electricity.

The record of the demand made by the consumer for one isolated time is no benefit to the station, as isolated individual maximum demands made by several customers would be made at different times and on different days and the station would not be called upon to supply the sum of these demands at one time; but if an individual consumer made repeated demands upon the station, knowledge of this fact would be desirable to fix an equitable rate to offset the increased installation required to meet that demand.

On the other hand, a thorough knowledge of the several rates of consumption made by consumers would make it possible to fix low rates and thereby encourage the use of current over more hours and thus more evenly load the plant and thereby enure to the benefit of the station.

Vibrators are disadvantageous inasmuch as they are not automatic, making it necessary to guess at the amount of current to be used to set them in the first instance, which varies for every month of the year, or devolving on the consumer the necessity of making subsequent adjustments, which, if made in the middle or latter end of the month, causes him to feel overcharged for the first part.

A perfect rate meter must not only be automatic and thereby register the lowest rate demanded, but must not register the maximum rate until that demand has been made a sufficient number of times to make it necessary to set apart a definite portion of the installation to meet that demand. Such a rate meter, in an installation driven by water power, or in other words, where the fixed charges greatly predominate, would meet all wants in a most satisfactory manner. no recording watt-hour meter being necessary in such a case, as by it, proper charges, based on the installation operated to supply each individual customer, could be made.

In plants where the generating and distributing costs are high. a recording watt-hour meter is a necessary adjunct to the rate meter; together they leave nothing to be desired, as by their use the long-hour customer with light demand and the short-hour customer with heavy demand can be singled out and equitable rates, based on costs to the station, made.

Another advantage in the use of a rate meter is keeping down the peak load, which determines the capacity of the plant, thus increasing the efficiency by making it possible to use the peak load margin in supplying more customers and giving greater satisfaction by supplying current at a lower rate per kilowatt-hour.

In ordinary flat-rate contracts based on lamps installed, the consumer limits the number to the smallest amount and to get the full value burns them as long as possible; the station manager must combat this tendency by a high rate; the result is small business and high peak loads.

In contradistinction where rates are based on average demand, houses are more liberally wired, and where the convenience is at hand the tendency is to use it, and with the better rate a better satisfied and more profitable customer accrues to the station.

It is believed that a device which will meet all foregoing requirements which are essential to a perfect rate-indicator has now been devised and is described in U. S. Letters Patent No. 640,466, issued to Jesse Harris, January, 2 1900. It consists of a solenoid within the open interior of which is drawn a laminated core of iron by the current traversing the coil; the pull on the core is opposed by a weight carrying a pointer in front of a scale arranged by means of a pawl and rack to travel out on an arm. It operates as follows:

When the pull of the solenoid is sufficient to overcome the weight the arm will raise and the pawl attached to the weight will advance one notch in the rack; in this position the meter will be in position upon decrease or shutting off of current to advance one point and register: this operation is repeated at each subsequent time that the current reaches a magnitude greater than last registered. After reading, the meter is reset by sliding the weight to its original position.

The meter here described is a simple mechanical device not liable to get out of order and for accuracy can be relied upon.

*Paper read at the Fourth Annual Transmission Convention, held at Mount Tamalpais, Cal., June 19-20, 1900.

A New Electric Meter.

A new variety of electric meter, or indicator, has been devised, which works on an entirely new principle. In all electric light and power installations meters, not of the registering type like a gas meter, but indicators, much like the pressure guage on a steam boiler, are used to indicate the condition of the current output as regards volume and pressure. These have almost invariably worked on some principle involving the magnetic effect of the current, and have been generally very delicate and complex in construction as well as expensive. For large stations where great volumes of current are to be measured, or wherever high electrical pressures are used, their use has not been attended with the greatest satisfaction by reason of certain inherent defects. The new type of meter employs auxiliary power in the shape of compressed air. to move a column of liquid in a tube, this being the visible indicator of the instrument. while the delicate magnetic parts are used only to regulate the flow of the air. A small motor of the size used to drive the ordinary electric fan is used to work a little pump and compress air to about three or four pounds to the square inch pressure. This air flows into a receiver connected with a glass tube and a reservoir of oil, so that the height at which the oil stands in the tube is a measure of the pressure of the air. From this receiver the air escapes through a little safety valve, to which are attached the delicate coils of the instrument. Variations in the strength or pressure of the current measured, as the case may be, cause these coils to exert a correspondingly heavier or lighter pressure on the safety valve, which is constantly blowing off. Hence the variations of the current appear as corresponding variations of the air pressure in the receiver, and of the height of the column of oil. As the current measured has practically no work to do, merely to control the valve, very small current variations can be made to show as large changes in the height of the column, which is highly desirable.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended August 11:

Antwerp, 4 cases, $986; 50 packages, $4,895; Argentine Republic, 220 packages, $11,099; 69 cases, $3,931; 18 packages motors, $893; 2 crates automobiles, $737; Australia, 107 cases, $5,475; Berlin, 1 case, $25; Bremen, 1 package, $11; Bordeaux, 6 cases, $150; Brazil, 20 cases, $828; British Guiana, 4 cases, $145; British West Indies, 14 cases, $213; other British Possessions, 88 packages, $4,066; Bristol, 37 cases, $7,000; 18 reels electric cables, $2,438; Budapest, 1 case, $41; Central America, 2 cases, $55; Chili, 104 packages, $2,493; Cuba, 36 packages, $737; Ecuador, 6 packages, $252; Glasgow, 81 cases, $39,-415; 81 reels cable, $33,393; 2 packages trolley poles, $130; Gothenburg, 2 boxes, $120; Hamburg, 41 packages, $15,676; 1 case, $50; Havre, 235 packages, $29,585; Hull, 6 packages, $602; Leeds, 8 packages, $166; Liverpool, 3 packages, $19; 3 boxes motors, $555; London, 672 packages, $50,928; 10 packages automobiles, $1,500; 27 packages motors, $1,041; 283 trolley poles, $12,222; 17 cases, $766; Madrid, 12 cases, $1,618; 216 trolley poles, $8,000; Manchester, 4 boxes, $5,165; Mexico, 25 packages, $2,667; Peru, 49 cases, $2,810; Porto Rico, 836 packages, $1,653; Santo Domingo, 4 boxes, $52; Southampton, 17 cases, $1,130; St. Petersburg, 4 cases, $2,019; Stockholm, 1 case, $110; Uruguay, 8 packages, $920; U. S. Colombia, 15 packages, $975; 10 cases, $258; Venezuela, 3 cases, $76.

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CANADIAN NOTES.

(From our Ottawa Correspondent.)

Mr. Edwin Hanson, president of the Havana Electric Railway Company, has just returned from New York to Montreal. He has been in the former city looking after matters pertaining to the enterprise. The Havana Electric Railway Company, which has taken over the property of the Ferro Company, has now in course of construction about 80 miles of track, and the company proposes to operate on its system about 120 cars.

Mr. William Kennedy, C. E., of Montreal, has returned from a trip to Europe. He has been abroad for the purpose of attending the shipment of turbines for which he had contracted with a Switzerland firm last fall. The turbines are for the Cataract Power Company of Hamilton, Ont., and are to be used under the head of 267 feet of water in the transmission of power from St. Catherine's to Hamilton, a distance of 34 miles. Mr. Kennedy went to Austria, France and other European countries, but found that in Switzerland the people were furthest advanced in the utilization of water under high heads.

At a meeting of the Cape Breton Tramway and Electric Company recently held at Sydney, B. C., it was decided to build an electric railway in the town of Sydney and suburbs, to engage an engineer and, as soon as proposed routes will be surveyed, to commence the construction of the tramway. A committee was appointed to consider the advisability of extending the line to Glace Bay. The construction of the line between North Sydney and Sydney mines was considered but not decided on. The company is capitalized at $500,000.

Mr. J. B. Charleson of Ottawa, who is building the Dominion Government telegraph line to the Yukon, says that the section from Atlin to Telegraph Creek, a distance of 222 miles, is completed. The section from Tagish to Atlin, 80 miles, was previously built, which makes a total of 302 miles of wire in the northern end. To the south, wires have been strung from Quesnelle to Hazleton, 342 miles, leaving 300 miles between the two inside ends of the wires. A connection will be made about the end of September or early in October. About the same time connection will be made with the line into Dawson City. In the meantime communication with that city is kept up on the interspaces north and south, by relays of horses. The line from Quesnelle to Ashcroft, a distance of 220 miles, is being repoled. Branches are to be put to Hoselly, 72 miles, and from French Lake to Manson Creek, Omenica.

When the electric lines now being built by the Niagara, St. Catherines and Toronto Electric Railway Company are completed, the Greater Buffalo-Niagara District will have the best system of electric railways in the world. This company is building on the Canadian side of the Niagara River and it will work in conjunction with the International Traction Company, which now affords such a fine service. Work is progressing rapidly, and in a few weeks the Canadian company will have all its lines operated. The company, some time ago, purchased the franchise of the Niagara Central Railway, between Niagara Falls, Ont., and St. Catherines, as well as the Niagara Falls road between that town and Niagara Falls South. The company is rebuilding the roads with new materials throughout.

"The Bird is on the Wing."

When the great Persian poet wrote the above line, he had no idea of applying it to a Pullman car, but the poet of the Pullman Company who names the cars seems to have adopted this idea, as the latest examples of Pullman design in parlor cars have just been delivered to the New York Central, and their names are Raven, Starling and Robin. They will be placed in service on the Empire State Express within a few days, and are as handsome as cars can be. It is difficult to add to the popularity of this most famous train, but if it can be done the Pullman people intend to do it, if the handsomest cars that can be built will accomplish that result.—From the Utica Daily Press.

LEGAL NOTES.

The Canadian General Electric Company of Toronto recently brought suit against the Toronto Railway Company for damages and an injunction to prevent the latter company from manufacturing certain electrical machinery upon which the plaintiff company say it holds four patents. The patents are on series parallel controllers and improvements on controllers for electric motors.

Papers in a suit have been filed with U. S. Circuit Clerk Williams of Buffalo, N. Y. The suit is entitled "The Electric Vehicle Company of New Jersey vs. the Buffalo Gasoline Motor Company." The Electric Vehicle Company claims serious infringement of patent rights. The letters patent concerned in the case are No. 549,160, and were granted in 1895 to George B. Selden of Rochester, N. Y., who is co plaintiff.

PERSONAL MENTION.

Mr. C. E. Flech, who was recently employed in the electrical business in Schenectady, N. Y., has lately accepted a position as superintendent of an electric light station in Cuba.

Mr. Nelson Perin, president of the United Railways & Electric Company of Baltimore, Md., returned to that city recently after an absence abroad of about three months.

INCORPORATIONS.

The Washington Electric Fountain & Supply Company, Trenton, N. J. Capital stock, $100,000.

The Paraguay Development Company, Philadelphia, Pa. —to open up and develop the natural resources of South American countries, especially of the Republic of Paraguay; to provide for electric and other lighting plants. Capital stock, $500,000.

The Automatic Electric Works, Des Moines, Ia. Capital stock, $5,000 Incorporators: E. I. McGorrisk, Pauline J. Rotermund and P. H. Ryan.

The Electric Fire Engine Company, Portland, Me.—to deal in electrical fire engines and electrical apparatus for extinguishing fire. Capital stock, $5,000. Incorporators: Walter A. Morgan, Ernest O. Hiller and Llewellyn Carlton.

The Susquehanna Valley Electric Company, Albany, N. Y. —to operate in Delaware County. Capital stock, $200,000. Directors: Henry B. Oakman and Edwin H. Tucker of Brooklyn, Charles F. Lehman of Smithtown, and C. C. Higgins of Bedford.

The Crouse Hinds Electric Company, Syracuse, N.Y. Capital stock, $10,000. Incorporators: H. B. Crouse, J. L. Hinds and J. A. Hopper, all of Syracuse.

The Middleburg & Schoharie Electric Light, Heat & Power Company of Middleburg, N. Y.—to manufacture electricity for light, heat and power in Middleburg and Schoharie. Capital stock, $40,000. Directors: Daniel D. Frisbie, G. N. Frisbie and Dow Beekman, Middleburg.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL. Nos. 302-304 Broadway, New York City. N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED AUGUST 7, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

655,216. Switch for Suspended Electric Conductors. John Floyd, Washington, D. C. Filed Dec. 8, 1899.

655,217. Crossing for Suspended Electric Conductors. John Floyd, Washington, D. C. Filed Dec. 8, 1899.

655,389. Safety Device for Electric Vehicles. Frank E Case, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 20, 1899.

655,455. Electric Railway. William B. Purvis, Philadelphia, Pa. Filed April 24, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

655,176. Electric Arc Lamp. Johann F. Ackermann, New York City. Filed Oct. 20, 1899.

655,266. Electric-Arc Lamp. John S. Nowotny, Madisonville, O. Filed July 12, 1898.

655,526. Electric-Arc Lamp. Thomas Spencer, Philadelphia, Pa., assignor to the Helios Upton Company, same place. Filed May 14, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

655,237. Apparatus for Transforming Alternating Currents into Continuous Currents, and Vice Versa. Maurice Hutin and Maurice Leblanc, Paris, France. Filed April 28, 1899.

655,249. Telegraphic Typewriter. Reinhold Kubler, Berlin, Germany. Filed Aug. 29, 1898.

655,268. Electric Motor. Ernst G. P. Oelschlager, Charlottenburg, and Carl O. F. Schrottke, Berlin, Germany, assignors to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Dec. 27, 1897.

655,276. Measuring Instrument. Franz Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Nov. 18, 1899.

655,335 Motor-Starter. Ethelbert M. Frazer, San Francisco, Cal., assignor, by mesne assignments, to the Otis Elevator Company of New Jersey. Filed March 11, 1899.

655,336. Controller. Ethelbert M. Frazer, San Francisco, Cal., assignor, by mesne assignments, to the Otis Elevator Company of New Jersey. Filed July 20, 1899.

655,340. Starting Device for Electric Motors. Johannes H. F. Gorges, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Dec. 31, 1897.

655,353. Meter. Carl O. F. Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Dec. 27, 1897.

655,412. Circuit Closer. Jeremiah O'Meara, New York City. Filed May 20, 1899.

655,491. Electrically-Driven Machine. Theodore H. Joseph and James J. Ehrenreich, New York City. Filed Jan. 27, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

655,620. Telephonic Apparatus. Alfred Graham, London, England. Filed Oct. 17, 1898.

655,651. Multiplex Telephony. Ernest A. Faller, San Francisco, Cal., assignor of one-half to James W. Chisholm, same place. Filed April 27, 1900.

MISCELLANEOUS.

655,195. Gramophone Sound-Box. George K. Cheney, New York City, assignor to the National Gramophone Corporation, same place. Filed Oct. 18, 1899.

655,203. Telegraphic Transmitter and Receiver. Albert C. Crehore, Hanover, N. H., and George O. Squier, Fortress Monroe, Va. Filed June 7, 1899.

655,219. System of Electrical Distribution. Emmerich E. Frischmuth, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Oct. 2, 1899.

655,225. Magazine-Phonograph. George V. Gress, Atlanta, Ga. Filed April 12, 1898.

655,238. Process of Transforming Alternating Currents into Continuous Currents, and Vice Versa. Maurice Hutin and Maurice Leblanc, Paris, France, assignors to the Societe Anonyme pour la Transmission de la Force par l'Electricite, same place. Original application filed April 28, 1899. Divided and this application filed May 29, 1900.

655,239. Process of Bleaching by Electrolytic Chlorin Water. Thomas Jespersen, Neenah, Wis. Filed May 29, 1899.

655,264. Sign or Signal for Calling Cabs. Arthur G. R. Nichol, New York City. Filed Sept. 1, 1899.

655,265. Electric Cable. George H. Nisbett, Huyton, England. Filed Dec. 28, 1897.

655,289. Igniter for Explosive-Engines Louis Witry, Waterloo, Ia., assignor to the Waterloo Gasoline Engine Company same place. Filed Dec. 16, 1899.

655,317. Electric Temperature-Indicator. Leslie S. Wilder, Springfield, Mass. Filed Nov. 18, 1899.

655,341. System of Alternating-Current Transmission. Johannes H. F. Gorges, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Oct. 11, 1899.

655,343. Electrolytic Cell. James Hargreaves, Widnes, Eng. Filed Jan. 31, 1899.

655,368. Electrical Battery. Charles E. O'Keenan, Paris, France. Filed Dec. 30, 1897.

655,406. Electric Sparker for Gasoline-Engines. John G. MacPherson, Philadelphia, Pa., assignor to the MacPherson Automobile Company of New Jersey. Filed Nov. 22, 1899.

655,411. Electrical Detector for Heat or Cold. Jeremiah O'Meara, New York City. Filed May 12, 1899.

655,427. Burglar or Fire Alarm. Franklin D. Wallace, Wheatland, Ind. Filed Oct. 20, 1899.

655,433. Magnetic Separator. Charles F. Courtney and Robert Butterworth, Broken Hill, New South Wales. Filed March 19, 1900.

655,476. Electric Lock. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Nov. 28, 1899.

655,480. Phonographic Reproducing Device. Thomas A. Edison, Llewellyn Park, N. J. Filed May 3, 1900.

655,562. Brake for Electric Motors. Charles A. Lindstrom, Chicago Ill., assignor, by direct and mesne assignments, to the Hewitt-Lindstrom Motor Company, same place. Filed May 5, 1899.

655,563. Electric Carriage. Charles A. Lindstrom, Chicago, Ill., assignor, by direct and mesne assignments, to the Hewitt-Lindstrom Motor Company, same place. Filed March 3, 1900.

655,671. Electric Conductor for Exercising Apparatus. Alfred M. Crooker and Frank N. McDonald, Boston, Mass., assignors to the Galvanic Health Exercising Company of South Dakota. Filed March 10, 1900.

DESIGN.

33,054. Connector for Electric Wires. Clarence D. Platt, Bridgeport, Conn. Filed June 12, 1900. Term of patent 7 years.

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THE TELEPHONE WORLD.

Stock of the New York 'Phone Company Increased.

A special meeting of the stockholders of the New York Telephone Company was held on the 8th inst. for the purpose of considering a proposition to increase the capital stock from $16,000,000 to $30,000,000. One hundred and fifty-nine thousand nine hundred and seventy shares out of 160,000 were represented at the meeting, and a resolution to increase the capital stock to the amount named was carried unanimously. Thomas F. Clark, vice-president of the Western Union Telegraph Company, and who is also a director of the New York Telephone Company, said after the meeting that so far as he knew the increase was not made for the purpose of absorbing any other telephone companies

"I presume," he said, "that the additional capital will be used in the regular course of the company's business." Mr. Clark added that he knew of no project to extend the operations of the company outside the city.

The purpose of the company in almost doubling its capital stock, it is generally assumed, is to provide it with resources to fight the Telephone, Telegraph & Cable Company of America, which was recently formed to compete with the New York Telephone Company. The new organization is backed by several prominent capitalists, and their avowed purpose is to break down the monopoly in this city which the older company possesses.

The line of the Louisa Telephone Company between Richmond and Louisa, Va., was formally opened on August 1. Richmond is now connected with Gordonsville, and in a few weeks the line to Charlottesville from Gordonsville will be complete. There is only a small gap between Charlottesville and Staunton. From Staunton there is a line to Clifton Forge and Covington, almost at the West Virginia line, and down the valley as far as Harrisonburg, in Rockingham County. Lexington, Buena Vista and Natural Bridge are also on this line. Of course, all these independent lines are used by subscribers free of charge. Long-distance conversation is charged for.

The Pennsylvania Telephone Company has a force of men at work placing poles and stringing wires at Mt. Gretna, Pa., for the use of the National Guard encampment. An instrument has already been placed at division headquarters, and one 'phone will be placed at each of the three brigade headquarters, at the cavalry and artillery camp headquarters, making a total of six telephones. These instruments will constitute a system in itself with outside communication.

Telephone subscribers in Decatur, Ga., are highly elated over the fact that they now have a Bell telephone exchange of their own. Heretofore, all telephonic communication in that town was effected through the Atlanta main office, but now all connections will be made in the Decatur office. Recently the growth in subscribers in the vicinity of Kirkwood and Decatur has been such as to seriously overcome the lines and render any additional growth an economical impossibility.

The People's Home Telephone Company of Birmingham, Ala., is hard at work putting in its system, according to the franchise granted by the mayor and board of aldermen of that city. Four miles of poles are up and $40,000 worth of material has been contracted for.

The Cumberland Telephone Company has increased its toll rates from Lynnville to Murfreesboro, Nashville, Columbia, Lewisburg, Mt. Pleasant, Tenn., and a number of smaller places. But a small sum was added to the usual rates, and the change went into effect about ten days ago.

The prospects are that the Georgia Telephone Company of Savannah will build a long distance telephone line from Savannah to Macon via Dublin, Ga. Mr. J. D. Persons of the Dublin Telephone Exchange when in Savannah was informed that the line would probably be built at an early date.

The Gainesboro Telephone Company is improving the line between Gainesboro and Carthage, Tenn. Four through lines are being added. A line was established from Granville to Enigma.

Manager J. Luther Williams of the Tifton (Ga.) Telephone Exchange has about perfected arrangements for a local exchange at the town of Adel, between Tifton and Valdosta and has already about forty members.

The board of public works of Hudson, N. Y., has given notice to all the telegraph and telephone companies in that city that their poles must be painted within 60 days or they will be taken down.

The Duluth (Minn.) Telephone Company (Bell) announces the completion of connections with towns as far east as Ashland, Hurley and Ironwood and intermediate points.

The Ways of the Bell.

About a year ago when the Binghamton Telephone Company was agitated, and subscribers for it were being secured, says the "Republican" of Binghamton, N.Y., the Bell Telephone Company, through its solicitors visited nearly every office and business place and most residences in the city which had not a telephone, offering to put in the following two kinds of 'phones: $12 per year limited to 15 calls a month and five cents for every call in excess of that number; $1 per year and five cents per call with a guarantee of one call a day or fifty cents a month as the case might be. This was the scale price, but in nearly all cases the guarantee was not required and the service was not limited to a certain number of calls as in the first.

Now that certain aldermen have succeeded in holding up the Binghamton Telephone Company franchise a higher scale of prices has been inaugurated by the Bell Company in that city. A week ago several solicitors armed with a newly prepared scale of prices began to visit the places where the contracts made a year ago had expired and the rise in price was announced. As a result many who before had availed themselves of the service of the company refused to have the 'phones installed at the new price.

The new scale of prices adopted does away with the $12 'phone and leaves as the next lowest the open ring at $18 for residences and the four party call 'phone at $24, both for a three year contract, or $30 for a one year contract.

The prices now prevailing are: Business 'phones, direct, $72, two party select $60, four party $42, four party open ring, $36; residence, direct, $30, two party $27, four party $24, open ring, $18; nickel in the slot 'phone, $1 per year and five cents per call, and thirty calls per month guarantee. All the above prices are net, and with the exception of the last one are for a three year guarantee. Higher prices prevail for a contract of a year at $30 for the four party 'phone, which for a three year contract is $24. No unlimited residence service will be furnished for less than a three year contract for less than $30 a year.

Those who installed the $12 'phones and the nickel in the slot at $1 per year, are the ones who will be deprived of the use of the company's service as the one year contracts are now running out, and the cheap telephone service which the people were promised by the Bell Company is becoming a thing of the past.

Telephone Development in the New England States.

The annual report of the Boston and New York Telephone & Telegraph Company gives some interesting statistics on the development of the independent telephone movement in the New England States. President Charles E. Adams, at the recent annual meeting, said that contracts with 5,500 subscribers covering periods of five years had been made for the use of the exchange, which is now being built in Boston.

"During the past year," he said, "a large amount of preliminary work has been accomplished for the establishment of a telephone exchange in Boston and other cities and towns in Massachusetts, together with the construction of a toll line between the cities of Boston and New York. A large proportion of our subscriptions are for commercial purposes, showing that business men believe that the best telephone service can be obtained at much lower rates than now exist.

"Rights of way have been acquired from Boston to New York for the purpose of building a toll line between those cities, embracing the best construction, together with the latest improvements in telephony. We have secured telephone franchises and rights of way in 55 cities and towns in New England, and a model exchange has been constructed in Stoughton, Mass."

The Boston and New York Telephone & Telegraph Company is one of the sub-companies controlled by the Telephone, Telegraph & Cable Company of America. The officers and directors are: President, Charles E. Adams; secretary, John B. Stauffer; treasurer, Oakes Ames, all of Boston; W. H. Eckert, H. E. Gawtry, W. J. Latta, Charles W. Morse, Martin Maloney, Frank Tilford, all of New York; Frank Cutting, Z. Swift Holbrook and Arthur S. Temple of Boston; Wm. F. Hallstead, Scranton, Pa.; J. B. McCall, Philadelphia, and J. L. Wolcott, Dover, Del.

The Henry County Telephone Company of New London, Ia., has decided to build a line to Mt. Union and has sent in an order to Minneapolis for poles, which are expected to arrive soon. The route extends north along the Winfield road in Scott township, and thence east to Mt. Union, covering a distance of twelve miles.

The Hampden Automatic Telephone Company has lately been granted a franchise in Chicopee, Mass. The company has secured a franchise in Springfield, and a petition in Westfield, Mass, is pending.

Western Farmers Use Telephones.

A system of toll line telephones with local exchanges on a co-operative plan is rapidly covering the whole of Northeastern Kansas. The telephone has come to be regarded as a necessity by the farmers there, but in its practical workings it is benefiting St. Joseph and not Kansas City.

The Interstate Telephone Company's last card shows 172 toll stations in Kansas, Missouri, Nebraska and Iowa, the proportion being in the order of the names of the States. It has spread out over Northwest Missouri until there is scarcely a town in the old Platte purchase and along the railroads north and east of St. Joseph that does not have its telephone, while in Doniphan, Brown, Nemaha and Marshall counties in Kansas, every town has its telephone toll station, and every town of 500 people has its local exchange. These people are now demanding a line to Kansas City and it may be worth while for Kansas City to help them. The Missouri and Kansas Telephone Company has toll stations at some of the larger of these towns.

Sabetha in Nemaha County has 1,000 people and more than 100 telephones. Most of them run to houses on the townsite, but every rich farmer within five miles has his telephone. The company is a local mutual concern and the farmers, of course, have to bear the expense of extending the lines to their farms. There is scarcely a business man in the town who does not order goods by telephone, and because he can order them by telephone from St. Joseph and not from Kansas City, St. Joseph is getting business Kansas City would get but for the telephone.

Fairview has less than 400 people. It has a little local exchange for the people in the town, but is rapidly extending into the country. A shipper of stock who lives two miles from the town recently told how he watched the cattle market. He said, "When cattle are ready to ship, we take them off water in the morning and along in the afternoon call up St. Joseph. It only costs a quarter and the telephone is in the house, so all we have to do is make the call for St. Joseph after dinner and in two or three minutes are connected through. Then I can talk to the commission house in St. Joseph and get the latest market information. If conditions are favorable I ship that night; if not, I hold the stock till the next day or the next, and ship when the market is good on the strength of advices over the telephone."

A. W. Bisbee of Jacksonville, Fla., who was so successful in introducing an independent telephone system in Savannah, Ga., despite the bitter fight made against him by the Bell Company, has applied for a franchise in Macon, Ga. The city council is in favor of granting it. The Bell Company fight the opposition.

Eastern capitalists have purchased the stock of the Tri-City Telephone Company of Clinton, Ia., and will extend the line which is now operative in three counties. It is thought that the National Telephone Company, which was recently incorporated at Trenton, N. J., is back of the deal and is after the business of the Bell Company.

The Bell Telephone Company of Buffalo, N. Y., is still being submitted to a great deal of trouble through the actions of late employes, who were discharged when the strike was declared. Almost every day communication on some of the lines is interrupted by reason of the alleged destructive propensities of the strikers.

An independent telephone company has received the material for the construction of a line from Bucyrus to Plankton, O. The work is now under way.

Whitwell, Tenn., will soon have two telephone exchanges. One is being built by the East Tennessee people and the other by the Dixie Telephone Company.

The Bell and Mutual telephone systems at Vicksburg, Mich., have been consolidated, the former company succeeding to the business.

The People's Telephone Company of Shelby, O., lately creased its capital stock from $35,000 to $50,000.

TELEPHONE INCORPORATIONS.

The National Telephone Equipment Company, Detroit, Mich.—to manufacture and sell telephones, etc. Capital stock, $100,000. Incorporators: H. O'Connor, E. H. Parker, both of Detroit; W. O. Sterling, Jr., of Monroe.

The New Concord Telephone Company, New Concord, O.—to construct and operate a telephone line. Capital stock, $10,000. Incorporators: L. I. Graham, O. M. Shipley, S. W. Lorimer, T. J. Racer and J. B. Bain.

The Franklinville Telephone Company, Franklinville, N. Y. Capital stock, $10,000. Directors: C. R. Randall, R. S. Litchfield, and G. W. G. Ferris, all of Franklinville.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Anniston, Ala.—The Anniston Manufacturing Company has awarded the contract for a complete electric light equipment for their cotton mill. An equipment sufficient for 450 lights will be put in.

Bergen, N. Y.—O. R. Bissell, of Cleveland, has succeeded in obtaining from the village fathers a franchise to erect, maintain and control an electric light plant in this village, with its accompanying accessories, poles and wires for a period of 25 years.

Billerica, Mass.—The citizens voted last week to take preliminary steps for establishing an electric light plant for this town. The present plant will be purchased.

Bradford, Pa.—It it reported that Bradford is trying to buy an electric light plant.

Cattaragus, N. Y.—The new electric light plant is rapidly progressing. The plant is to be run by water power and a dam covering nine acres is being built. The work is under the supervision of Mr. Setter of North Collins.

Clayton, Ala.—This place contemplates the erection of an electric light plant.

Crisfield, Md.—The Crisfield Ice Manufacturing Company will erect an electric light plant, provided the council will grant a proper franchise and will award the company the contract for municipal lighting. Dr. G. T. Atkinson, president.

Egg Harbor City, N. J.—During a recent thunder storm lightning struck the power house of the electric light company, completely demolishing the dynamo.

Elmore, O.—Fort Wayne capitalists want to put in an electric light plant here, providing the town will contract for 12 arc lights of 1,200 candle power for $700 per year for a period of ten years.

Franklin, O.—The village council is getting figures on the cost, etc., of a municipal electric lighting plant for this place.

Georgetown, Ky.—The Georgetown Electric Light, Water & Power Company, which was sold at receiver's sale recently, was purchased by R. W. Nelson for $30,000.

Grand Island, Neb.—The committee on lights has recommended an appropriation of $5,000 for installing an electric light plant in the waterworks pumping station. Ed. Hopper, city clerk.

Greenwood, Ind.—This city contemplates the erection of an electric light plant. G. W. Carpenter, city clerk.

Hailey, Idaho.—A $30,000 electric light plant is proposed for this place. W. T. Riley is the promoter.

Ilion, N. Y.—Messrs. Heacock, Van Deusen and Morgan are a committee having in charge the erection and installing of the new municipal electric light plant at this place.

Kirkwood, Mo.—The municipal committee of this place has been authorized by the board of aldermen to purchase the lot on which the proposed municipal lighting plant will be erected. City Clerk Hawken will advertise for bids for the sale of city bonds to the amount of $17,000. Owen Ford, of St. Louis, is drawing up the plans.

Laurel, Md.—The water board has about determined upon the location of the supply dam for the water system for this town, and the purchase of the local electric light plant has also been considered desirable.

Lewiston, Idaho.—The Lewiston Water & Light Company will spend about $20,000 in improving its electric light plant. F. W. Kittenbach, president.

Lockport, N. Y.—A change in the system of lighting will be made by the substitution of electricity or gas in place of the oil lamps now used.

Lowell, Mass.—The Lowell Electric Light Company has voted to increase its capital stock from $300,000 to $400,000.

Marlborough, N. J.—Plans are being prepared for the new electric light plant to be erected at this place.

Mayville, Mich.—The electric light plant at this place was recently burned. Loss about $10,000.

New Castle, Pa.—The city council has adopted a measure providing for the establishment of a municipal electric light plant.

North Adams, Mass.—The North Adams Gas and Electric Light Company is about to build a substantial addition to its electric light plant.

Oskaloosa, Ia.—Bids are asked until August 20 for lighting this city for from five to fifteen years, requiring about 50 2,000 cp. arc, and 50 32 cp. incandescent lights. Address C. E. Munroe, city clerk.

Pensacola, Fla.—Bids are asked until August 31 for lighting the streets and alleys of this city for three, five, or ten years from January 1, 1901. Address F. Glackmeyer, clerk.

Perry, Ia.—T. A. Grist of Cedar Rapids, County Auditor G. R. Lyon and Harley B. Brown of this city have purchased the electric light and heating plant from Messrs. Frank Dodson and John R. Swearingen. The consideration was $60,000. The new owners expect to take charge of the plant about September 1.

Philadelphia, Pa.—The Philadelphia Electric Light Company will raise $2,500,000 by assessment and improve and extend its system. A. J. De Camp, manager.

Poughkeepsie, N. Y.—It is suggested that electricity be installed as an illuminant in School No. 8, as every year the school is used as a polling place, and at the time of its use artificial light must be resorted to at the opening of the polls on election day, and after 4 o'clock on election and registry days. The use of oil on these occasions is not only inconvenient but antiquated.

Rio, Wis.—This place is to have an electric light plant. O. Ingram has been granted a 25 year franchise.

Roseburg, Ore.—A company will soon be incorporated here with $150,000 capital stock for the purpose of building an electric light plant.

Saginaw, Mich.—The proposals for erecting a municipal lighting plant for this city recently received are to be rejected by the board of public works and an engineer may be employed to draw up new specifications and new bids advertised for.

Shamokin, Pa.—The question of erecting an electric light plant here is being discussed by the city council.

St. Louis, Mo.—The Missouri-Edison Electric Company has lately announced a reduction in price of the standard incandescent lamp to twenty cents, and with the end of its service to this city, September 1, will have a large additional station capacity that it will offer to the public at very low prices and under exceptional conditions.

Wallingford, Conn.—R. Wallace & Sons are to have their own electric light plant, and will put in 1,000 lights.

West Plains, Mo.—This city contemplates the erection of an electric light plant.

Winchester, Ore.—A company has lately been organized here with a capital of $150,000 for the purpose of utilizing the water power at this place. An electric light plant will be one of the enterprises taken in hand by the company.

Yardley, Pa.—During a recent storm lightning damaged the electric light plant here.

STREET RAILWAYS.

Alexandria Bay, N. Y.—Eleven prominent business men of Plessis have recently conferred with the officials of the Electric Railway Company in regard to extending the proposed road from the Bay to Redwood through to Plessis. The town is three miles distant from Redwood and is a center of freight traffic for a large community.

Brookfield, Mass.—The selectmen have signed a franchise for an electric railway from here to Gilbertville. The State has appropriated $5,000 for the State road in Gilbertville.

Charleroi, Pa.—A movement is on foot to build an electric road from here to Washington in this State.

Decatur, Ind.—James McHaney of Cincinnati is here in the interest of capitalists of that city who want to construct an electric road between this city and Fort Wayne, a distance of 22 miles.

Detroit, Mich.—The International Construction Company of this city was lately awarded the contract for building the Flint, Saginaw & Bay City Electric Railway. It will be 50 miles long and will use the third-rail system. The contract is with the Saginaw Suburban Railway. Price, $800,000.

Far Rockaway, N. Y.—The citizens of this place are backing up a petition of the railroad company for the extension of the Ocean Avenue trolley line from its present terminus on the Far Rockaway inlet at the foot of Broadway to the outer beach.

Grand Rapids, Mich.—An electric railroad from here to Grand Haven and Muskegon is to be built at once. The company has completed organization here with J. D. Hawks president, and W. Franklin treasurer. The railway will cost $1,500,000.

Hartford, Conn.—The Connecticut Lighting & Power Company have secured right of way for a new trolley line from Waterbury to Southington. The object of the company is to have a line from Naugatuck to Waterbury, from Waterbury to this city by way of Southington and New Britain.

Lima, O.—The Lima Railway Company of this city has increased its capital stock from $200,000 to $500,000, and changed its name to the Lima Electric Railway & Light Company.

London, O.—The Columbus, London & Springfield Railroad Company was lately granted a franchise by the commissioners to build an electric railway through Madison County.

Marcellus, N. Y.—Work is being pushed on the new electric road which is being built from here to Otisco Lake. The company has promised to have the road completed and the cars running by the first of October, and the indications are that this will be done.

Miamisburg, O.—The Miamisburg & Germantown Traction Company of this city was lately incorporated for $50,000 by W. A. Mays, C. W. Dodds, S. H. Mays and A. F. Gwin. The company will build an electric railway from Germantown to Miamisburg.

Newport News, Va.—It has been announced that the Citizens' Light & Power Company will complete the electric railway between this city and Hampton, which was started by the defunct Peninsula Railway Company.

Northville, Mich.—People all along the proposed extension of the Detroit, Plymouth & Northville Electric Railway from here to Walled Lake are extremely anxious for the road.

Novi, Mich.—This town is to have an electric railroad in the near future.

Peru, Ind.—F. C. Boyd of New Haven, Conn., who has been anxious to build an electric line between Wabash and this city has again taken up the matter.

Preston, Minn.—The Ohio Trust Company has submitted to the business men of this place, a proposal for the building of an electric railway from Decorah, Ia., to Chatfield, Minn., via Preston. The road if built will give Preston connection with the Burlington, Cedar Rapids & Northern, on the south, and with the Chicago & Northwestern on the north.

Taunton, Mass.—The air line electric railroad promoters who have laid out a direct route from this city to New Bedford intend to begin operations early in the spring. The running time to New Bedford will be about an hour and a quarter.

Upland, Pa.—The borough council has granted the right of way in this place to the Media, Middletown, Aston & Chester Electric Railway Company.

Weyauwega, Wis.—The survey of the electric line between Berlin, Waupaca New London, Wautona and this city will begin this month. The road will be built by a stock company composed of Chicago railroad men and when completed will have cost over $600,000. A. L. Hutchinson of this place is the chief promoter of the deal.

Yantic, Conn.—The contract for the new electric railroad from here to Baltic has been given to Boston parties.

MANUFACTURING.

Ft. Wayne, Ind.—The articles of incorporation of the new Belden-Larwill Electric & Manufacturing Company were received a short time ago and the company is now prepared to do business on a large scale.

Peru, Ind.—The Peru Electric Manufacturing Company of this city has sold the carbon department of the industry to the National Carbon Company of Cleveland, O., and the machinery will be removed to that city at once.

Pittsfield, Mass.—As the result of a recent visit to the West by Mr. Roebling, the principal owner of the Stanley Electric Manufacturing Company of this city, and Dr. F. A. C. Perrine, president and general manager of the same concern, an arrangement has been entered into with the Northern Electric Company of Madison, Wis., by which the two companies will manufacture and sell each other's class of machinery.

COMPANY MATTERS.

Manchester, N. H.—The consolidation of the Merrimac Heat, Power & Electric Company of this city and Hooksett, and the Manchester Electric Light Company was effected last week. The capitalization, united, is $1,150,000 and the total water power is 20,000, together with big steam power. This unites all of the electrical interests of this city including that of the street railway.

POWER AND TRANSMISSION PLANTS.

Parksville, S. C.—The Twin City Power Company has applied for a charter. The capital stock is to be $100,000, and the company proposes to develop water power on the Savannah River in the counties of Edgefield and Abbeville, and to build electric light plants, etc. The incorporators are S. Soylor, and W. H. Chew of New York, D. M. Mackaye of New Rochelle, N. Y.

Peach Bottom, Pa.—The Susquehanna Electric Power Company, a Baltimore corporation, will begin work on its $4,000,000 plant here about September 1. A dam will be constructed and a power house erected on the banks of the Susquehanna River. The plant will generate 40,000 horse power, of which the United Street Railway Company of Baltimore, has contracted for 20,000 horse power for forty years. The company will also furnish electric light for Baltimore.

Raubsville, Pa.—Work on the plant of the Lehigh Power Company, whose plant is situated on the Delaware canal between Riegelsville and this place, has been commenced, and the contract calls for its completion by November next, when the machinery is expected to be in operation.

St. Paul, Minn.—The falls of the Apple River in Wisconin will be utilized next month into power for factories in this city. Five thousand horse power will be available at the start, and that supply may be doubled. The opening of the new plant will mitigate in no small degree the local smoke nuisance.

AUTOMOBILES.

Ilion, N. Y.—The Remington Automobile and Motor Company, recently incorporated, will have its plant located here, and expects by winter to employ from 200 to 300 hands. The company will manufacture gasoline, steam, electric and other motor vehicles and also gasoline engines and small launches. The capital stock is $250,000. Philo E. Remington is president, S. C. Burch treasurer, and P. A. Stubblebein secretary.

Scranton, Pa.—P. J. Collins of this city has invented a new style of electric automobile and a company is being formed to manufacture it here.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Aug 13.						
United Traction	100	$5,000,000	$5 000,000	1½ % Q.,	128	124
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Aug 13:						
Allentown & Lehigh Val. Trac. Co.		4,000,000	1,500,000	....	..	15
Bridgeport, Conn—Aug 13:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Aug 13:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.—Aug 13:						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co........com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	143	144
Brooklyn N. Y.—Aug 13:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	231	233
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	58⅛	58¼
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	257	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., 99	323	330
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—Aug 13:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Aug 13						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Aug 13						
Charleston City Ry. Co	50	100,000	100,000	3 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—Aug 13						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	247	265
Chicago & South Side R. T. RR	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	.....	10	10¼
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	29	29¾
Met. West Side El., pfd	100	15,000,000	9,000,000	....	79	79½
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	200	203
South Chicago City Railway	100	2,000,000	1,603,200	....	96	99
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry..........com.	....	1,250,000	624,900	35 %	12	12½
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.—Aug 13:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	12
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Aug 13.						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—Aug 13						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Aug 13:						
City Railway Co..............com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co..............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	...	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranteed by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Aug 13.						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	—
Hartford & West Hartford RR	100	1,000,000	247,000	....	..	—
Holyoke Mass.—Aug 13.						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—Aug 13.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	—
Indianapolis, Ind—Aug 13.						
*† Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Aug 13						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	..	—
Lancaster & Col. Electric Ry	....	....	87,500	....	..	—
West End Street Railway	....	....	....	....	..	—
Louisville, Ky.—Aug 13:						
Louisville Ry..............com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry..............pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1.	109	110
Minneapolis, Minn.—Aug 13						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—Aug 13						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	249	250
Toronto Street Ry. Co	100	6,000.000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—Aug 13:						
Memphis Street Railway Co	100	500,000	500,000	....	25	—
New Haven, Conn.—Aug 13:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	—
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Aug 13						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR............guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Aug 13:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	800
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	100	125
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	154¾	155
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	392	400
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	4 5
j Ninth Avenue RR...........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	220
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	202
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	50	60
* Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Aug 13:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	58
North Jersey Railway Co	100	6,000,000	6,000,000	....	26	26¾
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	19½	20
Pittsburg, Pa.—Aug 13:						
Allegheny Traction Co	50	500,000	500,000	....	55	56
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	..	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27½	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..........com	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co..........pref	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.– Aug 13						
Union Street Railway Co.	100	$350,000	$550,000	2 %, Feb.	160	165
Northampton, Mass.– Aug 13						
Northampton Street Ry.	100	300,000	225,000	4 % A., June.	170	173
Omaha, Neb.– Aug 13:						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.– Aug 13						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.– Aug 13:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.– Aug 13						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount....	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. .... $12½ pd	50	30,000,000	29,980,450	....	36¾	37
*c*Electric Traction Co.	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry.	50	500,000	†192,500	$3 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.'99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry....	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry....	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98¼
*j*Catherine & Bainbridge St.	50	....	‖400,000	6 % A—Mar., '98.	...	..
*i*Continental Pass. Ry.....guar..	50	1,000,000	‖580,000	$6 share—July, '98.	153	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry.	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR..	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry...	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar...	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	268
Rochester, N. Y.– Aug 13						
Rochester Railway Co.	100	5,000,000	5,000,000	....	14	14¼
Reading, Pa.– Aug 13						
j Reading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry.	50	850,000	850,000	Jan., '98.	188	...
*l*East Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.– Aug 13:						
Fourth Street & Arsenal Ry.	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds....	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,800,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry. com.	50	500,000	500,000	....	20¼	21
United Electric Ry. 6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	67	67½
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.– Aug.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa– Aug 13						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.– Aug 13:						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.– Aug 13:						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.– Aug 13						
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.– Aug 13:						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S. ‡	97½	97⅝
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.– Aug 13:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	102⅞	102¼
Columbia Ry. Co	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	15	16
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.– Aug 13						
*Worcester Traction Co. com.	100	8,000,000	8,000,000	....	30	31
Worcester Traction Co. 6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb., '98.	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1897.	...	85
Wilkesbarre, Pa.– Aug 13.						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1 %, Jan..	26	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866–7–8 p.a. $20,000 in 1899–1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.– Aug 13						
American Bell Tel Co.	100	50,000,000	23,650,000	4½ % Q., Jan.	143½	144
Erie Telegraph & Telephone Co....	100	......	......	1 % Q., Feb. 20,	96	97
New England Telephone Co.	..	10,894,600	10,804,600	$1.50 p. sh. Feb	133	135
New York.– Aug 13						
American Telegraph & Cable Co..	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	105
*Commercial Cable Co	100	10,000,000	10,000,000	1½ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	53
Erie Telegraph & Telephone Co....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	115	117
*International Ocean Tel Co.guar6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan., '99.	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co..	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q. Jan. '99.	80⅜	80½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.– Aug 13:						
American Dist. Teleg. (Phila.).....	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	138	.
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q	122	125
Providence (R. I.) Teleph. Co.	50	......	......	...	94½	95
Southern New Eng. Teleph. Co.	100	8,000,000	......	...	--	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.– Aug 13:						
Fort Wayne Electric trust receipts.	..	......	......	...	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	..	36	46
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	.
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900	131¾	132
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,053	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.– Aug 13						
Edison Elec. Ill'g Co., New York..	100	9,133,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.		--
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co. com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Jan., 1900.	131¼	132
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa– Aug 13						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.	50	300,000	300,000	Q	--	--
Philadelphia, Pa.– Aug 13						
Edison Electric Light Co.	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	75	76
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	78	80
Northern Elec. Light & Power Co..	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.– Aug 13						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	158	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	97½	98
Rhode Island Elec. Protec. Co.	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2 % Q ‡	201	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1½ % Q	131	132½
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1, 98.	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.– Aug 13:						
American Electric Heating Co.	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh. Jan. 26, '99	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh. Nov '99.	--	100
New York.– Aug 13:						
Consolidated Electric Storage Co...	...	......	......	....	8	12
Safety Car Heating & Lighting Co..	100	......	......	......	150	155
Worthington Pump Co. com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co. pfd	100	2,000,000	2,000,000	7 % A	100	110
Philadelphia Pa.– Aug 13						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	2½	2⅝
United Gas Improvement Co..scrip.	50	10,000,000	......	---	--	162
Welsbach Commercial Co.....com.	100	3,500,000	......	---	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1½
Pittsburg, Pa.– Aug 13						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.– Aug 13						
*Barney & Smith Car Co.......com.	100	......	1,000,000	---	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co.	25	......	......	....	32	..
Consol. Car Heating Co	100	1,350,000	1,350,000	1½ % Feb	57	59
Johns-Pratt Co	100	......	......	---	105	109
*Pratt & Whitney Co. com.	100	......	......	---	2	4
*Pratt & Whitney Co. pfd	100	......	......	---	40	50
Stillwell-Bierce Co. com.	..	......	....	---	--	30
Stillwell-Bierce Co. pfd.	--	......	......	2 % Sept 1, '99.	70	65
Shults Belting Co.	100	500,000	......	....	80	90
St. Charles Car Co.		......	......	......	90	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Aug 13, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*118½	119⅛
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervliet Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‖Watervliet Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co......1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	113⅞	
†Baltimore Traction Co..... 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry...........1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry...........1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‖W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‖Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114¼
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,835,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	.....
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s.	$150,000	*$150,000	1912	*M. & N.	......	....
Crescent City RR............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	8,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	99½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry ....Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.....................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	...	
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.		

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	--
Empire Pass. Ry...................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	--
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	--
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	--
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	--
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	--
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	--
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	....	1943	...	....	--
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	--
Philadelphia Trac. Co........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1903	A. & O	....	--
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	--
§Union Traction Co.................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	--	.....
West End Passenger Ry....... 1st mtg. 7s.	....	....	1905	....	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	..
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Aug 13, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J.	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	...	....
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	...
Second Ave. Traction Co.....................5s.	2,500,000	2,000,000	1934	J. & D.	...	
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	...	

Providence R. I.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	....	
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Aug 13, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109¾
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J & J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—Aug 13, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co........................1st mtg. 5s	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co...................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co...............Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105¼	107
†Park & Ocean RR...................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*—Aug 13, 1900						
Belt Ry. Co..........................Cons. mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................Cons. mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 13, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,931,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105¼	106
St. Paul City Ry..........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Aug 13 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—Aug 13, 1900						
Allegheny County Light Co................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Aug 13 1900)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	......	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	10[illegible]
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 13. 1900.					100½	101
American Bell Telephone.......................4s.			1908	F. & A.	......	....
NorthwesternTelegraph Co................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 13, 1900						
American Electric Heating ....7s.	500,000	500.000	....	....	....	......
Armington & Sims Engine Co...............	....	....	....	....	......	25
Barney & Smith Car Co......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	......	....	1904	J & D.	......	......
Worthington‡Pump Co........................	75,000	....	......	....	115	127

‡Unlisted   Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16⅝@16¾c.; Lake, 16½@16⅝c.; casting, 16¼@16⅜c.

Business failures in the United Stated last week numbered 177, against 136 the same week last year.

It is again reported that President McCall, of the Philadelphia Electric Company, is to resign August 15 (to-day)

The National Telephone and Telegraph Company, capital $50,000,000, will probably not be organized before September 1.

The Chicago City Railway Company has declared the regular quarterly dividend of 3 per cent., payable September 29.

A dispatch from Springfield, O., states that the Dayton, New Carlisle & St. Paris Traction Company has filed a mortgage for $1,350,000.

The striking street car employes of St. Louis have incorporated the Labor Union Street Railway Company with a capital of $5,000.

The New York, Westchester & Connecticut Traction Company has filed a mortgage to secure $2,500,000 4 per cent. 50-year gold bonds.

Stockholders of the New York Telephone Company have voted unanimously to increase the capital stock from $16,000,000 to $30,000,000.

The Chesnut Hill Railroad Company of Philadelphia, Pa, has declared a dividend of 1½ per cent., payable September 4 as registered August 20.

The Schuylkill Traction Company of Philadelphia will increase its capital stock to $2,000,000 and build a road from Pottsville to Shenandoah, Pa.

Directors of the Metropolitan West Side Elevated (Chicago) have declared a dividend of 2 per cent., on the preferred stock, payable August 31.

The York (Pa) Traction Company has given a mortgage to secure an issue of bonds for $1,500,000 to the Real Estate Trust Company, of Philadelphia.

The Philadelphia, Germantown & Norristown Railroad Company has declared a dividend of 3 per cent., payable September 4 as registered August 8.

The report that was current recently to the effect that an alliance had been formed between the Long Island Railroad and the Brooklyn Rapid Transit Companies has been denied.

The Harrisburg (Pa.) Electric Light, Heat and Power Company has declared a dividend of one per cent. This is the second dividend and there will be another in December.

The Philadelphia "Stockholder" says that rumor has it that President Rossiter, of the Brooklyn Rapid Transit Company, will resign, to be succeeded by a representative of the Yerkes crowd.

Almost the entire plant of the Pittsburg Reduction Company's aluminum works at New Kensington was destroyed by a tornado. The loss is estimated at $100,000 and the works will be closed down indefinitely.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 14@17; New York Electric Vehicle Transportation, 7½@8½; New England Transportation, 4@4½; Gramophone, 35@40.

The Remington Automobile and Motor Company has been incorporated at Trenton, N. J., with a capital of $250,000. The plant will be at Ilion, N.Y., and it is expected that by the winter 200 to 300 hands will be employed.

The receipts of the United Traction Company of Albany, N. Y., for the week ending August 2 were $28,003 60 making a gain over the corresponding week of last year of $2,469 79. The Albany division's gain was $2,066 14 and the Troy division $403 65.

The Merrimac Heat, Power and Electric Company and the Manchester Electric Light Company of Manchester, N. H, have been consolidated with a capital of $1,450,000. This consolidation unites all the electrical and street railway interests in that city.

Wall Street is full of rumors about changes to be made in the management of Brooklyn Rapid Transit when the executive committee meets this week. All the stories agree that another president will be named, "An expert from Chicago" is said to have gone over the books and made and offer to run the road for 2 per cent. of what he could save.

The works of the New England Electrolytic Copper Company at Central Falls, R. I., have shut down for what is given out to be an indefinite period, but what is believed to be for all time. The corporation owns reduction works in Montana and at Perth Amboy, N. J., and has several times threatened to move its works from Central Falls on account of excessive taxation.

Refering to the new issue of stock of the Metropolitan Street Railway Company President Vreeland says: "Nothing more will be done in regard to the new issue of stock until late in the fall. Many of the most prominent directors are away in Europe and elsewhere, and, as we do not need money now, we will not, until their return, hold the meeting which will decide how the stock is to be disposed of."

A copper mining man, who is considered an authority and who has just returned from an extended trip in Europe, says that owing to the fact that metal interests on the other side did not believe in the advance in copper—and have in fact been fighting the advance—the European markets are almost bare of the metal, stocks having been used up to the extent of all available scrap. The demand abroad is large and is likely to continue so for months, so that, in his judgment, the price of the metal must advance and remain high until production has been increased very largely or consumption has been materially reduced. Neither of these changes, he says, after a careful study of the subject, is likely to be effected for at least twelve months.

A Chicago dispatch says that direct charges of "illegal and fraudulent contracts and false statements to Stock Exchanges" are made in a bill in chancery filed by Sutro Brothers of New York against the Chicago Union Traction Company and the Consolidated Traction Company and the answer to the bill filled by the Union Traction Company. The bills are the result of the recent merging of the Consolidated Traction line with the Union Traction Company, the main condition being the granting of down-town concessions to the outlying lines and the guaranteeing of $6,750,000 4½ per cent., bonds issued in exchange for Consolidated stock. Sutro Brothers denounce the contract as void and fraudulent on the ground that no fair compensation was given. Sutro Brothers are large holders of Consolidated stock.

The Union Traction Company of Philadelphia, Pa., has refunded the $200,000 7 per cent. bonds of the Empire line (12th and 16th streets), maturing this year, into 3½ per cents. Fixed charges of $14,000 are thereby cut down to $7,000. The bonded debts next to mature are the 13th and 14th streets $700,000 7 per cents., due October 1, 1903, and West Philadelphia $246,000 6s due April 1, 1906. In other ways the Union Traction Company has been gradually reducing its charges. Several of the old land mortgages have been paid off. The company has in some instances invested the money of its insurance fund, which amounts to about $600,000, in these mortgages at a reduced rate of interest, paying off the original holders. Another step towards more economical operations has been accomplished in the case of the Lehigh Avenue line, the entire capital, $600,000, having been bought in by the Union Traction Company, which now has a clear profit on this line over all operating expenses.

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EDITORIAL NOTES.

A New Scheme for Insulating Electrical Conductors.

About two and a half years ago we referred in these columns to a proposed method of insulating an electric current, suggested by a resident of Chicago. The arrangement consisted in inclosing the electric conductor in a train of underground tubing of insulating material from which the air had been exhausted. The idea was that by withdrawing all the air from the neighborhood of the conductor there would necessarily be an absence of moisture and consequently no opportunity for the escape of current through radiation. This scheme, owing presumably to several serious objections which we called attention to at the time, never came into use in a practical way, but the general idea would seem to be resurrected in a patent grated to Nikola Tesla last week. This patent, which is No. 655,838, refers to a method of insulating an electrical conductor by surrounding it with some substance which acts as a perfect insulator when frozen. The principal claim reads as follows:

"The method of insulating electric conductors which consists in laying or supporting the conductors in a trough or conduit filling the trough with a material which acquires insulating properties when frozen or solidified, and then causing a cooling agent to circulate through one or more channels extending through the material in the trough so as to freeze or solidify the material."

Referring to this invention in an interview Mr. Tesla is reported as saying:

"Prof. Dewar, of the Royal Institute, gave me the suggestion, which set me thinking along this line. That was in 1893. Realizing the great practical value of such an invention, I thought much about the subject, until a few weeks ago, when the complete system by which the desired end might be attained suddenly flashed across my mind as I was pondering upon the problem in my laboratory. Then the simplicity of the plan amazed me.

"Let me describe this method of insulation to you in its most comprehensive form. All wires will, of course, be placed underground before my cold air insulation can be used.

"Imagine, now, a great trough extending, if you wish, across the continent. It must contain a quantity of water or some other substance which will freeze. From my experiments I judge that sawdust and water will prove most effective. For the purpose of transmitting the current long distances I shall use a thin metal tube capable of resisting three hundred pounds pressure to the square inch. This tube will be submerged in the substance which I intend to freeze.

"In the whole discovery the most interesting feature is the method I have devised for freezing the material in the trough. Five or six feet below the surface the ground itself is very cold. Here the trough would be buried. Through the tube there will then be forced a current of gas—probably hydrogen—reduced to a temperature of minus 200 degrees or thereabouts.

"This, under ordinary circumstances, will be sufficient to freeze the material surrounding the tube in the trough, and also to neutralize the heat which would be generated by the electricity."

Mr. Tesla refers to the advantages that might be derived from his system of insulation as follows:

"It has been known since the days of Faraday that an electrical current cannot break through an insulation of ice. My success lies in discovering how to practically apply this truth. To show of what gigantic worth it may be needs but a moment. Grant that the invention has, as I believe, given to the world an almost perfect insulator, immediately there follow results which will directly or indirectly affect every manufacturing industry which in any way uses electricity.

"This will follow from the fact that no electricity will be lost in transmission. The cost of the new insulation will in the end be cheaper than that now used, and so it follows that the electricity which is to be utilized in a thousand different ways can be produced at a less cost. To telephone and telegraph companies, therefore, you see that my invention will be indispensable.

"Water power converted into electricity can by the new method of insulation be carried thousands of miles. At present the loss of electricity due to unsatisfactory insulation makes this impossible. I have been considering the possibility of carrying the power of Niagara to this city, and find that it can be done with a loss of not more than one-half per cent. to one per cent.

"For the first time in history a power will be used for insulation instead of a property.

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Deaths from contact with exposed wires will be prevented by the new method. The increase in the speed of exchange of telephone and telegraph messages will be pronounced after the adoption of my discovery.

"These are the important changes in the electrical world which will be wrought by this invention. There will be also innumerable indirect results."

This system of insulation as will readily be seen would entail the digging of trenches and laying of tubing, to say nothing of forcing a current of gas through the whole system, which, over a long distance, would entail an enormous initial expenditure of money. This would seem to be the principal objection to the system and one which would prohibit its adoption in carrying power to localities situated a hundred or more miles distant, where fuel could be obtained at reasonable prices. That such a system, if found practicable, would have its field of usefulness there is not the slightest doubt, but that field would be limited or not sufficiently extensive to warrant insulation manufacturers looking about for some other means of earning an honest living.

* * *

Electricity as a Hazard to Life and Property. The number of fires attributed to the use of electricity that has occurred in the United States during 1899, has furnished a theme eagerly seized by many of the daily papers wherewith to fill space and incidentally the hearts of unsophisticated readers with fear. It is portrayed in a sensational way that the "subtle electric fluid" is responsible for an immense number of deaths that would not have occurred had we been using the oil lamps and tallow candles of our forefathers.

One daily, the name of which we intentionally omit out of compassion, cackles as follows:

"When the lightning was harnessed the world contracted to pay Jove a frightful price for his thunderbolts. Human lives by thousands, property and money by millions, have been paid for the use of that mysterious power, electricity.

"What the stupendous cost has been may never be computed and may never be set down in exact figures. Recently, however, some insurance men have been trying to find out what is really being paid for the telephone, telegraph, electric light and trolley car. The data are so meagre that not even an approximation of the aggregate cost can be made. Enough has been learned, however, to cause the investigators to pause in horror, and to ejaculate, in all fervency:

"Great heavens! is it worth the price?"

Another well-known publication assumes in referring to this subject a somewhat resigned, though horrified tone, and says:

"One State in the Union officially electrocutes its criminals sentenced to death. That State and every other one, unofficially has victims to electricity every day, and from almost every walk of life. It is part of the premium paid by civilization for the harnessing of the greatest element in nature, and as an additional tax there is the tremendous loss of property by fires which result from the same cause.

"For ten years the "electric hazard" has been reckoned with in insurance companies: To-day they are asking, "Is electricity worth the price?"

"In 1899 the aggregate fire loss in the United States was $153,597,830. In 1900 it promises to be $160,000,000. Yet in 1885 the loss was only $102,000,000."

This paper adds that in 1898, 336 fires were directly traceable to electricity resulting in pecuniary loss of $4,999,000. In 1899 there were 750 fires and a property loss of $6,428,000.

"Again," says the publication already referred to, "Not all the fires of electric origin are traceable, for the reason that destruction is total and the evidences of the cause are destroyed. Some insurance men are insisting that half the fire losses of the cities result from the use of electricity; others that at least 25 per cent. are traceable to it."

Admitting that the fire losses in 1899 amounted to far more than in 1885 which is only natural owing to the increase in population during those fourteen years—for the reason given above it is hard to tell whether fires are of an electrical origin or not, and in view of this fact where a building wired for incandescent or arc lights is destroyed, it is very easy when no contrary evidence can be obtained, to say that the fire *must* have originated through a defect in the wires.

Referring to the loss of life by electricity, one of the sensational dailies says:

"But the question of the cost of electricity has another and very sensational aspect. It is the loss in human life that should make the whole world pause before gloating over the progress made in chaining that mysterious, fickle and dangerous power.

"It is this side of the matter, too, that brings the question home to the people, that warrants every man in asking whether the privilege of riding in a trolley car is worth such awful slaughter."

Though many lives are lost each year directly or indirectly through the use of electricity, we venture to say that there are not as many lives lost in that way as in some other ways. Look at the number of persons who are drowned each year, and yet no one for a moment asks "Is shipping worth the price?"

When it is remembered that electricity has now come into universal use and that it plays an important part in almost every line of industry, railway, lighting and manufacturing, the percentage of accidents and deaths to the total number of persons directly or indirectly earning a living through it, will, we think, on careful investigation, be found less than in many other enterprises.

* * *

A Third-Rail Railroad. In spite of much opposition and many objections, the third-rail electric system would seem slowly to be becoming more popular for heavy railroad work. As is generally known there are several such systems in operation in Connecticut and elsewhere, and now we hear of another line about to be operated on this principle. We refer to the Albany & Hudson Electric Railway & Power Company which will shortly be ready to transport passengers and freight by what is declared to be the most completely equipped electric railroad in the country. The line of the road extends from Rensselaer to Hudson, N. Y., a distance of thirty-eight miles, and the route lies through a thriving country, touching at Clinton Heights, East Greenbush, East Schodack, Nassau, North Chatham, Kinderhook, Niverville, Stuyvesant Falls, Stockport, Scottville and other villages and towns of minor importance.

The power for the operation of the cars is transmitted by a third rail, laid outside of the rails of the road, which is standard gauge, and which has been constructed in a manner to make the highest speed possible attainable. The third-rail, which according to a daily paper is the object of fear and wonder at the present time to the residents of the country through which the railroad passes, is not likely to cause trouble owing to the precautions that have been taken to reduce the number of accidents to a minimum. The company for its own protection and that of the life and property of dwellers along the line, has erected a closely woven wire fence on either side of the road its entire length.

It has posted conspicuously at every crossing notices of warning that the road is operated by an electric rail and that trespassing is dangerous. At every crossing, highway or private farm crossing cattle guards of the best approved pattern have been put down, and at all of these crossings the third rail has been broken, the ends being connected for the continuation of the current by a cable that runs through a conduit under the roadway.

On entering Albany over one of the viaducts across the Hudson and on entering Hudson the trolley system will be employed. The power for the road is furnished from a plant installed at Stuyvesant Falls, where 8,000 horse power is generated by a system of water wheels that will take the whole flow of the Kinderhook Creek.

The first practical test of the system took place last Saturday night when the machines at Stuyvesant Falls revolved for the first time, sending a current of electricity through the network of wires and cables. The plant will generate current at a pressure of 12,000 volts, which at Hudson, North Chatham and East Greenbush will be transformed down to 600 volts, which will be the working pressure along the line.

It is proposed to haul freight over the road by means of a large electric locomotive, similar to the one in use in the tunnel of the Baltimore & Ohio road at Baltimore. The running time between Albany and Hudson for the present will be about two hours.

The cost of the enterprise at present exceeds $2,500,000, and it is generally believed that the road is only the beginning of a scheme to connect Albany and New York by an electric system.

It has been the practice of the Patent Office, for many years past, to accept renewal petitions for lapsed allowed applications signed simply by the attorneys who filed the original applications and not, as required by law, by the "inventor, discoverer, or assignee." The matter was recently called to the attention of the Commissioner of Patents, and a circular was issued by the Department to parties interested, calling attention to the statute governing the case, by which the law requires the petition for renewal of allowed applications forfeited through failure to pay the final fee within six months from date of such allowance, to be signed by the inventor, discoverer, or assignee; and that such application must be filed in the Patent Office within two years after the allowance of the original application. In the event that the inventor be dead, then the petition must be signed by the administrator, or the executor; if insane, by the guardian, conservator or legal representative. It will not be accepted if signed by the attorney.

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UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE annual meeting of the New York State Street Railway Association will be held at Buffalo, N. Y., on September 18 and 19.

THE telephone service between Paris, Frankfort, and Berlin was opened to the public on August 6. The charge for the use of the line for 3 minutes between Frankfort and Paris is 80 cents, and between Paris and Berlin $1.20.

A PHYSICAN in the Corner's office of this city recently held an autopsy on the body of a man killed by lightning. It has been supposed that electrocution and lightning left a body in the same condition, but by the autopsy this was proved not to be the case. In electrocution large clots of blood form on the surface of the lungs and the pericardium, and every portion of the nervous system is made pliable. The body of the victim of lightning was found to be hardened noticeably, and there were no clots of blood on the lungs and the pericardium.

HARRY L. GOEHRING, a prominent member of the Allegheny County Bar, of Pittsburg, Pa., and James Scott, connected with the Carnegie Company, were badly hurt last Saturday in an automobile wreck. While riding Mr. Goehring increased the pressure to take a rather steep hill, when the gasoline tank exploded, throwing the machine fifteen feet into the air. Mr. Goehring was thrown to the pavement, alighton his head, and was rendered unconscious. Mr. Scott could not extricate himself, and fell with the burning machine on top of him. He was badly bruised. Both men, it is claimed, will recover.

THE meeting of the sixth annual convention of the Ohio Electric Light Association was held at Toledo recently. The meeting was presided over by the president, D. L. Gaskill. There were sixty-five electric companies on the list at roll-call. W. P. Ingalls, of Defiance, and F. E. Valentine, of Urbana, were made members of the organization. The address of welcome was made by Mayor Jones, after which the members and the women participated in a ride on the lake in a yacht. A paper was read by A. J. Stahl, of LaPorte, Ind., on the subject, "Two Revenues Instead of One; Electricity a Bi-Product." Another paper was by E. L. King, of the Fort Wayne Electrical Works, whose subject was "Induction Integrating Watt Meters." His paper was of a technical character and was voted by all to have been excellent.

ALL sorts of interesting features are to be included in the coming automobile exhibition and race meet at Washington Park, Chicago. The meet is to continue from September 18 to September 22 inclusive, and night races will be made possible through the use of the electric light. On the opening day there will be a general parade of nearly five hundred vehicles, with standing and moving exhibitions. Prizes will be given to the manufacturer presenting the greatest number of practical designs and to the manufacturer having the greatest number of automobiles in line. A special prize will be given for the most practical design of wagon for general purposes. The second day will be the commencement of the tests for general practical utility. There will be a hill-climbing contest, also a contest on an incline and decline grade, in which practicability and controlability of the vehicle will be demonstrated. Another important feature of the exhibition will be a mail race. Four mail boxes will be placed at equidistant points around the race track, and ten miles will be run, making forty stops in all, to collect the mail. Each driver will be obliged to stop at each box, unlock it and take a card from it and lock it again. The vehicle making the best time in the forty stops in the shortest space will be awarded the first prize, and the driver will receive a bonus. In all, $10,000 is to be awarded in prizes, and is to be apportioned to the events at the time of the final adoption of the programme. Bands of music will be in constant attendance and suburb decorations will make a most brilliant scene.

IN the "Revue Générale des Sciences, M Louis Olivier gives some further particulars of Paulsen's "telegraphone," which is attracting attention at the Paris Exhibition. He describes several devices for increasing the volume of sound or "intensifying" the record, to use the language of the photographer. The steel band with the consequent poles, which forms the original record, is made to pass between the poles of an electro-magnet, which transfers the record to another band. This may be done several times over, and the record taken simultaneously from all the bands. In another arrangement the record is intensified by passing it very rapidly through the second magnetic field, which, as we know, has the effect of increasing the induced currents, and therefore also the intensity of the secondary record.

THE scientific world is deeply interested in the announcement published in last Sunday's "Herald" of the discovery by the French chemists, MM. Desgrez and Balthazard, of a process for renewing air indefinitely. As described the method employed by these chemists completely restores to vitiated air its vital and wholesome quality. Bioxide or peroxide of sodium is used by the Frenchmen, and they assert that in process of decomposition, presumably at normal temperatures, it gives off oxygen and at the same time absorbs the carbonic acid produced by human breath and the burning of gas. The discoverers assert that by the application of their process divers and others who have to spend time under water or in tunnels or mines can have pure air created and continually renewed inside of an aluminum helmet, which is coated on the inside with a preparation of the bioxide of sodium.

Convention of the Canadian Electrical Association.

The annual convention of the Canadian Electrical Association will be held in the city of Kingston, Ont., on August 29, 30 and 31. A cordial invitation has been extended by the civic authorities, and also the electrical companies, which invitation has been accepted with the approval of the members and friends of the Association in Ottawa, where the convention was to have been held, but owing to the recent fire was found to be inadvisable to meet at Ottawa this year. The programme has not yet been completed, but will include the following papers to be read:

"Utilizing the Available Central Station Capacity," Prof. R. B. Owens, McGill University, Montreal.

"Use of Dynamo and Storage Battery in Telegraph Offices," W. J. Camp, of the C. P. R Telegraph Office, Montreal.

"Power Factor as Affecting Operation and Investment, with Special Reference to Induction Motors and Inclosed Arc Lamps," F. H. Leonard, Jr., Montreal.

"Government Electrical Standards," O. Higman, Ottawa.

"Railway Subject—giving several curves showing the average power during a day, and maximum and minimum requirements for power called for on the Quebec System," Mr. Blair, Quebec Railway & Lighting Company, Quebec.

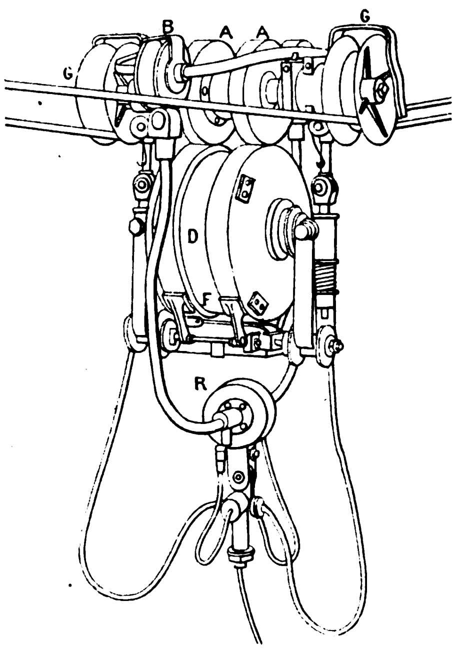
"Rotary Converters," A. Gordon Grier and J. C. Hyde, Montreal.

"Conditions Affecting the Wave Form of Alternators," Prof. L. A. Herdt, of McGill University, Montreal.

The City Council of Kingston has appropriated a sum of money for entertainment purposes, and has granted the use of the City Council Chamber for the sessions, also space in the City Hall for exhibits of electrical appliances, while the local electrical companies have agreed to furnish, free of charge, current and labor to exhibitors. Visitors will be given a trip through the Thousand Islands.

A LOMBARD-GERIN PATENT.

In the issue of ELECTRICITY of April 4, 1900, there appeared an article descriptive of what might be termed a trolley automobile—brought out in France by M. Louis Lombard-Gerin. This system, as will be recalled, consisted of an automobile operated by means of electric current taken from an overhead trolley wire by means of a flexible cable. The novelty of the system lay in the trolley contact, herewith shown, which consisted of a motor on



LOMBARD-GERIN AUTOMOBILE TROLLEY.

wheels, and for which a United States patent was granted the inventor on August 14. In claim 1 of the patent the invention is described as "an automobile-trolley comprising an apparatus provided with a shaft having a contact-roller adapted to travel on conductors insulated one from another, the said apparatus having a motor possessing a fixed inductor and a movable armature, the periphery of which directly actuates friction-rollers on the shaft of the said contact-rollers, in combination with a flexible cable which conveys the current to the motor of the vehicle."

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MOTORS.*

BY CLAUDE W. HILL.

In designing motors for some classes of work it is necessary to take into account not only the average hp. which the motor is to develop, but also the maximum torque which it is to exert. Where no limit of current is specified, the average hp. only need be considered; but in cases where a machine is specified to give a maximum torque with a current not exceeding a given figure, then the specified torque and

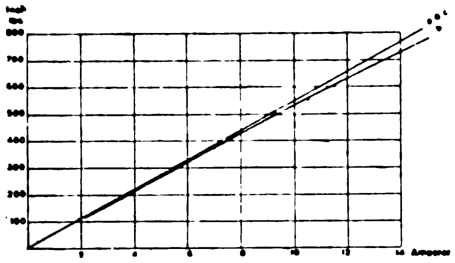

Fig. 1.

current must be taken as the basis of the design.

Taking the well-known formulæ, torque in inch-pounds,

$= \frac{63,025 \text{ hp.}}{s}$, and hp. $= \frac{E\,i}{746}$ (in which E = back EMF., and i = total current through motor armature), and combining them we get

$$\text{torque} = \frac{84.48\,E\,i}{s} \qquad (1)$$

or

$$s = \frac{84.48\,E\,i}{T} \qquad (2)$$

This formula shows that there is a certain speed for which a motor must be designed in order to fulfill fixed conditions as to voltage, current and torque, and it further shows that on a circuit of given voltage the smaller the current specified for the production of a given torque, the slower must be the speed (and therefore the larger the size) of the motor.

Formula No. 1 may be stated in another way. Taking

$E = \frac{N\,C\,S\,p}{10^8 \times 60 \times .5d}$, in which N = flux through one pole, C = total conductors around armature, p = number of pairs of poles, and d =

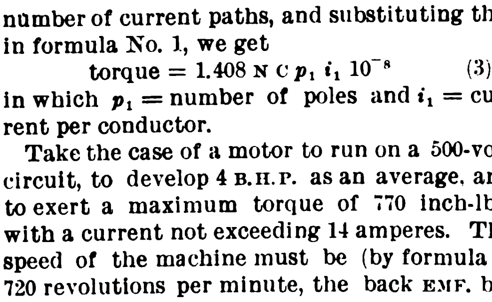

Fig. 2.

number of current paths, and substituting this in formula No. 1, we get

$$\text{torque} = 1.408\,N\,C\,p_1\,i_1\,10^{-8} \qquad (3)$$

in which p_1 = number of poles and i_1 = current per conductor.

Take the case of a motor to run on a 500-volt circuit, to develop 4 B.H.P. as an average, and to exert a maximum torque of 770 inch-lbs. with a current not exceeding 14 amperes. The speed of the machine must be (by formula 2) 720 revolutions per minute, the back EMF. being 467.5.

If instead of starting with formula No. 2 we start with formula No. 3, and calculate the value of N and C, we shall find that these values correspond to a speed of 720 revolutions with a back EMF. of 467.5.

There is no advantage in adopting a higher speed for the average hp., as the size of the machine is governed by the torque and current.

Thus if the machine were specified to give 4 B.H.P. at 1,400 revolutions with maximum torque and current as before, the carcass would still have to be of the size found by formulæ Nos. 2 and 3. It would have to be over-compounded, the shunt and series winding together giving 1,400 revolutions at 4 hp., and the series winding being sufficient to bring the speed down to 720 with the specified current. No gain would be effected in the size or price of the machine, the regulation would be bad, and the ratio of the reduction gearing would be increased with consequent loss of efficiency.

Where a steady speed is demanded and hand regulation is not possible, provided the supply pressure is maintained constant at the motor terminals, shunt winding will give the most satisfactory results, but where the leads are long and the fall of voltage appreciable, the magnet will be weakened, the specified current will be exceeded and there may be sparking. Compound winding should then be adopted, the series winding being proportioned to compensate the drop of volts on the shunt coil and so maintain a constant strength of magnet. The regulation will not be so good as with the shunt motor working on constant pressure, but the result obtained will be better than with the shunt machine working with varying pressure.

These points are illustrated in the accompanying curves of the machine mentioned above.

Fig. 1 is the curve of torque and current: *a* being for the shunt machine on constant pressure; *b* for the shunt machine with a fall of 15 per cent. in the voltage at maximum current; *c* for compound machine with the same fall. It will be noticed that *a* and *c* coincide.

Fig. 2 gives the curve of torque and speed under the same conditions.

*From the "Electrical Review," London.

Cancellation of Bonds for the Free Zone.

The Treasury Department at Washington has issued a statement with reference to the cancellation of bonds covering goods shipped in transit to Mexico, to the effect that the privilege accorded prior to the Act of March 1, 1895, covering merchandise destined for the so-called Free Zone, having been restored by the act approved May 21, 1900, bonds covering merchandise destined for any place in the Republic of Mexico may now be cancelled by certificate of inspection and exportation issued by the Collector at the frontier port and a landing certificate given under the hand and seal of the Collector or other chief revenue officer at the foreign port.

MODERN ELECTRICALLY OPERATED MACHINE LATHES.

BY FRANK C. PERKINS.

The most up-to-date machine shops in this country are rapidly installing electrically driven machinery and are finding out from experience that they are not only successful in every way, but are more economical, simple and easier operated than those of older designs. The Brooks Locomotive Works of Dunkirk, N. Y., has recently installed a large wheel lathe which is electrically driven, as shown in illustration, Fig. 1. This machine is a double wheel electrical lathe and swings 79" in diameter.

The face plates can be driven together or separately, or at the same or different speeds, as

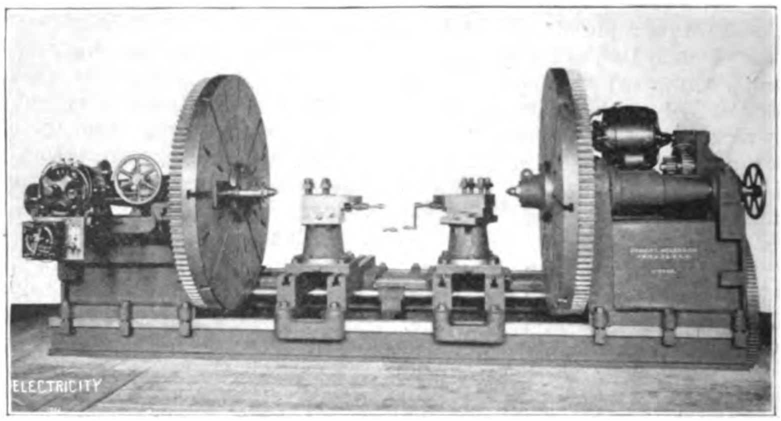

Fig. 1.—Electric Wheel Lathe at Brooks Locomotive Works, Dunkirk, N. Y.

desired. Feeds variable and self-acting at all angles by overhead rock shaft, actuated by slotted cranks at end of spindles. Each main spindle has an internal sliding spindle, with sufficient movement beyond face plates to swing driving wheels on axles when crank pins are in place. The center line of spindles is carried backward so as to bring the cutting strains on greatest diameters within the area of bed, by which means the front slides are elevated to correspond with curvature of face plates, increasing the strength of bed where subject to the greatest strains, also shortening, and consequently stilling the tool rests.

This electric lathe was installed by Bement, Miles & Co., of Philadelphia, Pa.

Fig. 2 shows a 52" electric engine lathe which was recently installed in the plant of the Chicago Ship Building Company. The illustration will show plainly the manner of connection, which is done by means of a short belt and has proven entirely satisfactory. The electric motor, shown in Fig. 3, is a C. & C. double commutator motor with field control, five horse power, 220 volt, with range of speed from 250 to 650 revolutions per minute. This electric lathe was installed by The American Tool Works of Cincinnati, O. The headstock is especially rigid and is secured to the foundation by bolts, which are tapped directly into the bed, making it very solid and absolutely precluding all tendency to vibration. The spindle is made of a special hammered steel, accurately ground. The bearings are made of the best phosphor bronze, and have special fa-

cilities for lubrication. The carriage is 60" long, and has more metal over the inside V than is usually found in engine lathes. It has a full bearing on both outside Vs, and is further secured against vibration by having a bearing on the front inside V, and to all three of these bearings it is accurately fitted by scraping. The compound rest is provided with power cross and angular feeds. The base is graduated so that taper turning or boring can

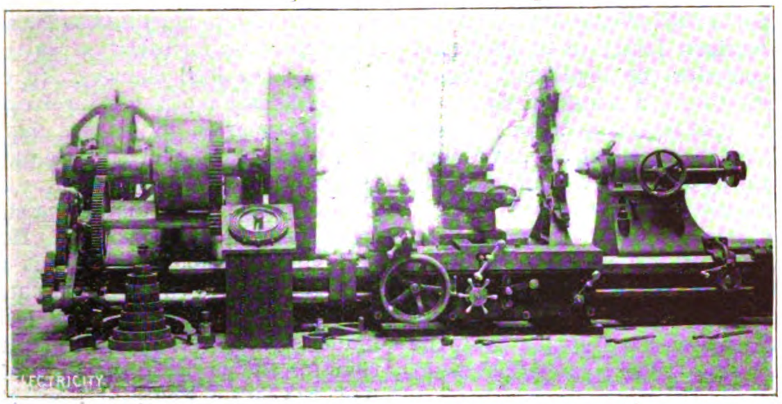

Fig. 2.—Electric Lathe at the Chicago Ship Building Company's Works.

be done with accuracy. The top slide has an extra long movement, and is provided with four clamping bolts, which hold the tool rigid. The automatic stop is adjustable on the bed, and can be set to stop the carriage at any given point. The tailstock has a long continuous bearing on the Vs, is easily and rapidly moved along the bed by means of the crank and gears, as shown. It is provided with a setover adjustment independent of the base. The base is clamped to the bed by four large bolts, and is further secured against movement by a

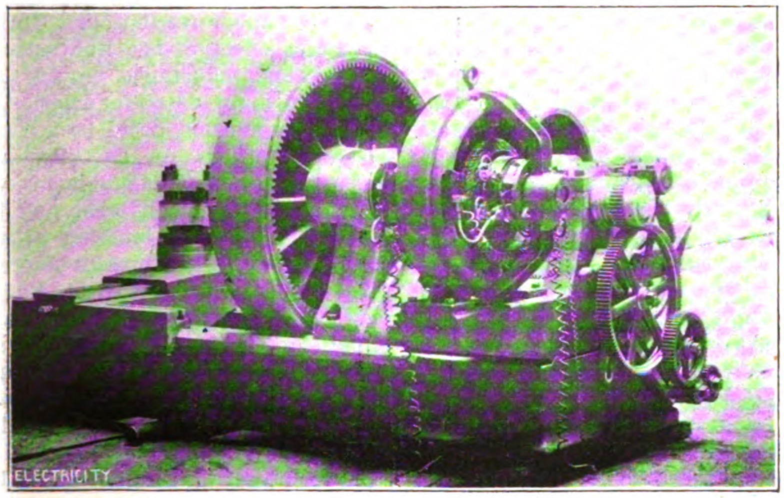

Fig. 3.—Head End of Electric Lathe at Chicago Ship Building Company's Works.

pawl engaging a rack in the center of the bed and cast integral with it. The spindle is operated from the front side of the tailstock through the hand-wheel and gears, as shown. All gears, including bevel and spur pinions are cut from the solid and the rack pinions, are made of steel and accurately cut, while all parts subjected to wear are case hardened.

Opposed to Wireless Telegraphy.

It seems that the steamers crossing the English channel between Dover and Calais will not be equipped with wireless telegraphy apparatus, as was announced some time ago. This is owing to the fact that the British Post Office authorities object to the scheme.

REGULATION IN LONG-DISTANCE TRANSMISSION.*

BY FREDERIC A. C. PERRINE, D. SC.

When we speak of the regulation in an electric plant of any kind, it is common to refer only to the maintenance of the proper voltage at the lamps or the motors of the customers, but in order that a proper system of distribution in the regulation for the customer be obtained, it is necessary in the design of the plant to consider regulation at many different points and of several different kinds in order that the service offered may be perfectly satisfactory. In the first place, the periodicity of an alternating-current supply must be maintained constant, which means that the water wheels must be adapted with regulators which will produce a constant speed of running, irrespective of changes in the load and changes in the voltage. Passing the water wheels and approaching the generators we find that here the regulation is one of voltage, and that in the generating station the voltage must vary with varying load, even though the customer may require a voltage as constant as the periodicity. The step-up transformers in the generating station are involved as one of the factors which determine the amount of voltage variation which the generator must provide, and passing these transformers we find in the line a disturbing element that must be carefully considered, even though at its end a voltage as nearly constant as may be must be attained. The final adjustment of the voltage to suit the customer's needs is provided in the sub-station where the step-down transformers are located.

It is the writer's purpose to call attention to the difficulties of regulation at each one of these points and to point to general solutions in overcoming such difficulties as may be presented without trying to offer the definite solution of any particular case. This discussion, therefore, may serve merely to make the ideas already familiar to us all more concrete, and to call attention to a few neglected conditions in obtaining a perfectly satisfactory service.

As has already been said, the regulation of the water wheels must be such as will maintain constant speed, and such constancy is obtained in a different manner with high and low head wheels. With wheels operating under a low head of water, large penstocks in which the water moves at a low velocity are generally available, and, in consequence, regulation of such wheels is always provided by variation of gate opening. This system of regulation, while certainly difficult to accomplish on account of the weight of the moving parts, is ideal in respect to conservation of water, the water allowed to flow being in some respect proportionate to the load. We say "in some respect," on account of the fact that the efficiency of all water wheels falls very materially as the load decreases. This difficulty of efficiency variation produces a difficulty in regulation, for the reason that a certain load change at full load requires a smaller gate variation than the same load change at one-quarter load, and in order to surmount this difficulty a recent Italian designer has attempted to close bucket openings in place of the gate openings in his wheel, thus operating certain buckets always with full volume of water maintaining full bucket efficiency at all loads. Such wheels have not been built in this country, although a set has been contracted for by the Montmorency Electric Power Company at Quebec, where the wheels under this design are now being installed.

The good regulating points of the low head wheels are sacrificed whenever the velocity of flow or the length of a column in the penstocks is increased, and their regulation is correspondingly improved by shortening the penstocks, even to its entire obliteration, and operating the wheels in the forebay itself.

However obvious this may seem, it is nevertheless the fact that in an eastern plant recently installed and not yet in operation, the engineers have led the water from the forebay through 160 feet of entirely unnecessary penstocks laid level.

Low head wheels are of far less importance to the members of the Pacific Coast Electric Transmission Association than are those operating under high heads. The characteristic of a high head plant differing from that of a low head plant is that the penstock instead of being short, of large diameter and of low water velocity, is long, of comparatively small diameter, with the water velocity rising as high as 12 to 15 feet per second. From this condition results that any attempt to regulate the wheels by varying the flow of water produces fluctuations in the pipe which are not only difficult to resist mechanically in pipe construction, but also are most disastrous to attempts at regulation, since the curve of efficiency of the high head water wheel varies much more rapidly from full load to one-quarter load than the curve of efficiency of the low head wheel; and furthermore, any attempt at closing the water gate at the end of a long pipe in which

*Paper read at the Fourth Annual Transmission Convention, held at Mount Tamalpais, Cal., June 19-20, 1900.

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the water is flowing at a high velocity is resisted by the water within the pipe with a tendency to momentarily maintain the same energy without much reference to the size of the opening. The effect of varying the opening in the water gate is to vary the velocity of the water flowing through it, and, as the energy is equal to one-half the mass times the velocity squared, the variation of velocity tends to maintain a constant amount of energy imparted to the wheel in spite of the variations in the mass. In a station operating more than one wheel from the same pipe line, this effect is distributed amongst all the wheels running, and it is often possible by closing one gate partially to speed up all wheels for an instant, the wheels only attaining the proper speed due to the reduced opening after they have been subjected to a series of impulses from the surging water within the main pipe. In one case, to which the attention of the writer was called, where wheels were operated under about 250 feet of head, closing of a single gate at the power house would cause the water to rise in the forebay as much as ten feet, which rise was necessarily occasioned by variations in pressure equal to about ten per cent. of the full pressure at the power house. Furthermore, it is hardly to be conceived that any throttling nozzle that has been devised can prevent leakage and prevent eddies of water on the back of the bucket producing disturbances of the speed regulation. In consequence of these facts, it seems to be the conclusion that regulation of high head wheels can be best obtained by a system which does not disturb the flow of water in the pipe line, which points either to the deflecting nozzle or the deflecting hood, and while we have no tests of the two systems which are thoroughly reliable, it certainly seems that the undistorted stream from a deflecting nozzle should give higher wheel efficiency at partial loads than will the distorted stream produced by a deflecting hood. If either of these systems is to be used the plant should be so installed as to reduce the wastage of water at partial loads as far as possible, since, of course, with a deflecting nozzle or a hood, the flow of water through the nozzle is always constant. Such a sub-division, therefore, of the water wheel units is necessary as will allow cutting out of entire wheels when the load shall vary materially. It is not the desire of any engineer to install small generating units which this system of regulation seems to entail, but the same result can be obtained by a multiplication of the number of wheels attached to each generating unit. Up to the present time no more than two wheels per generator have been installed in any high head plant, though in certain low head plants as many as five or six wheels have been attached to one generator. Should high head plants be installed with as many wheels as this the cost of the entire plant could be kept down by increasing the speed of the generators very materially. In fact, for units as large as 1,000 kilowatts a speed of from 600 to 1,000 revolutions should be readily attained and the cost of such a plant with five or six wheels on the generator shaft would not be greater than the cost of a plant with one wheel running at about 200 revolutions attached to a generator of the same capacity.

When we pass from the water wheel to the generator, we find that while the water wheel must regulate for constant speed, the generator, which is operated at the constant speed of the water wheel, must be adapted for variable voltage regulation. In specifying generators it is far more common to demand extreme self-regulation as regards constant voltage than it is to demand a possibility of great voltage variation, whereas in the generating station the machine must necessarily be varied in voltage even though a constant voltage be demanded by the customer, and, in consequence, machines that are designed for self-regulation of constant voltage are not generally satisfactory in long-distance transmission plants. This is especially true on account of the fact that it is the custom authorized by the standardizing rules of the American Institute of Electrical Engineers to measure the regulating properties of the generator on a non-inductive load. A non-inductive load in a long distance transmission plant is an impossibility, for even though the plant be used only when furnishing a non-inductive load, as of incandescent lights, the lines and transformers introduce at the generator a reactance which must be taken care of by the design of the machine. Indeed, the extremes of reactance are always encountered in such plants, since at low loads the long lines will make the generator current lead; at high load, they may lag very materially. In consequence of these facts, the inductive regulation of the generator as such must be as high as possible, though the ohmic resistance of the machine need not be necessarily low as would be the case for a close self-regulating machine operated on a non-inductive load; and many generators acceptable in power stations for the reason that under the conditions of non-inductive operation very close self-regulating properties, are unsatisfactory in long-distance plants: both for the reason that they will vary in voltage greatly when inductive loads are applied, and furthermore, they have not sufficient margin of field capacity to permit of over-excitation necessary for overcoming the effect of the lag factor. In consequence, the capacity of both the field and the armature must be higher than is commonly allowed, or else under the common circumstances of running, the machines will not be able to use within 10 or 15 per cent. of the full energy delivered by the water wheels. It is not often acceptable in long-distance transmission plants that the generators should have a possible voltage regulation equal to the full amount of the line loss, but they must be designed to permit from two to three times the voltage variation determined by the losses in the lines. It may seem anomalous to state in the beginning that the machines need not be designed for close self-regulation and in the end that their inductive drop must be smaller, but when it is remembered that close self-regulation may be produced by low ohmic resistance, which is unnecessary for small inductive drop, the anomaly is explained. A complete discussion of this effect was given by Prof. Cory last year before the Association.

The same observations are true of the step-up transformers; this, also, having been called to the attention of the Association last year by the writer in discussion of the experiments in Stockton. The only essential difference between the transformer effect and the generator effect being, that while the regulation of the generator on non-inductive load can be about one-third the regulation of the transformers on an inductive load, it seems to be impossible to design a generator better than about one-fifth as good regulation as the best transformers, though the writer's observations last year on transformers show that while a transformer designed for two per cent. non-inductive regulation may give a ten per cent. rise in voltage on a leading current, it has been found that transformers with the same non-inductive regulation can be designed to give a voltage rise, under the same conditions, not over one-quarter as great: and, furthermore, as the machine must compensate for the voltage regulation, both within its own coils and also within the coils of the step-up and step-down transformers, as well as throughout the whole line, it follows that the transformers should be designed to relieve machines as far as possible of great necessity for variation as the inductive effect of the load changes. In consequence, the specification of the inductive drop through a transformer is, in general, more important than a specification of the non-inductive regulation.

Perhaps the worst disturbing effect of all is to be found in the line itself. Here we have not only an inductive drop, but also a heavy capacity current, the capacity current remaining practically constant at all loads while the inductive drop varies with the load. The question for the proper disposition of the line to have the capacity current from the line counteract entirely the various reactances throughout the circuit, is a very alluring one and has been tried by many designers; but as the capacity current remains constant while the reactance continually varies with the load, it is impossible to so adjust the line in height above the ground a distance between wires as to effect any serviceable self-regulation. If self-regulation consisted in the maintenance of a constant voltage at a constant load, the line might be so designed as to aid in producing this effect, but as the load falls the importance of the leading current in the line becomes greater, while as the load rises its importance diminishes, in both cases disturbing the voltage and demanding from the machine a wide range of possible manual regulation. Until recently, the exact effect of the line as regards both capacity and inductance, proved to be a difficult problem presented for solution, though, of course, the solution could be accomplished by several methods on devoting a sufficient amount of time. This problem is one that has given the writer much labor, and it was with pleasure that in conjunction with Mr. F. G. Baum, he was able to present before the American Institute of Electrical Engineers this year a simpler solution for the regulation of a circuit for any character or changes of load, taking into account not only the questions of the load and transformers, but also the line. The line itself limits the amount of power that can be transmitted to a great distance, for the reason that for a line of about 100 miles in length, with voltage between 40,000 and 50,000, from 1,200 to 1,500 kilo-volt amperes must be used in charging the line—unless reactance coils are used—and, in consequence, an amount of power less than about 3,000 horse power cannot be satisfactorily delivered such a distance even where the selling price of power should be enough to counterbalance the cost of the line of such a length, the large capacity current making a question of any feasible system of regulation almost an impossibility with a smaller amount of power to be delivered.

By the use of reactance coils at the sub-station the generator current at no load can be made very small, and I believe it will pay to put in reactance coils on long lines not only to reduce the generator current and line loss at no load, but as sub-station voltage regulators.

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If half the charging current be neutralized, the lower limit given for the power that may be transmitted over a 100-mile line will be reduced one-half.

I believe the proper way to regulate the voltage at the sub-station is by the use of adjustable reactance coils and a compensated voltmeter at the generating station. In any case, feeder regulators should be put on the feeder circuits, but no regulators on transformers, especially where two or more banks are operated in parallel.

Finally we come to the regulation within the sub-station. A sub-station must deliver voltages that are constant within short periods at the very least. The customer may demand a voltage variation on account of the losses within the distribution lines as his load changes, but during such periods as the customer's load remains constant, the voltages must remain constant. The fact that his voltage may change with his load demands some system of manual regulation within the sub-station, and while a possibility of varying the voltage at the sub-station on the customer's lines as much as fifteen per cent. is in almost the extreme case ample allowance, the fact that the generator will necessarily alter its voltage with an alteration in the character of the load, irrespective of its size, it is not generally safe to install a sub-station system in which at least twenty-five per cent. voltage variation is not in the extreme cases possible.

In this paper nothing very startling has been presented, but it is the writer's opinion that the following points are somewhat new and demand careful consideration:

First—The subdivision of water wheels and the use of extremely high-speed machinery.

Second—A wide range in the possible voltage variation in the generators, with generators and transformers both designed not for good non-inductive load regulation, but for good inductive load regulation.

Third—Lines designed for the smallest possible capacity current without reference to any attempt at balancing the line capacity against the load lag.

Fourth—The use of reactance coils at the sub-station—instead of regulator heads on transformers—and wide range of regulators in feeder circuits.

Work Done on the New York Rapid Transit Subway Up-to-Date.

(From the N. Y. Herald.)

While it is now three months since the first actual excavation for the rapid transit subway was made, and the majority of New Yorkers have seen no evidence of work on what will be the greatest underground railroad in the world, progress satisfactory to those who have its construction in charge has been made.

Some of the contractors have been held back and the work delayed by a tardy delivery of steel, but William Barclay Parsons, chief engineer of the Rapid Transit Commission, has been advised that shipments will be begun before the end of the month. By that time excavations at several points will have been so far advanced that steel can be put in as soon as it is received, and then progress rapid enough to reassure the most sceptical can be made.

There are at present more than three hundred men working daily on the subway. These are employed on five of the fifteen sections into which the work has been divided. These five sections include about half of the distance of the tunnel line, but the excavation so far accomplished is inconsiderable when compared to the work to be done

To be convinced that work on the road is really under way it is only necessary for one to take a trip to Washington Heights and see what has been accomplished on the thirteenth and fourteenth sections, which include the stretch between 133d street and Hillside ave. McCabe Brothers, of Baltimore, have the contract for these sections, and, with the exception of a distance of a few blocks, it means boring a tunnel through solid rock, at some places one hundred feet below the surface.

The little hole in the ground that Corporation Counsel Whalen made on May 14 at 156th street and Broadway with a silver pick is now a trench twenty feet wide, fifteen feet deep, and extending up to 158th street. At this point it will be necessary to go down only seven feet more, as a station will be built there, and the roof of the subway will be only a few feet below the surface. From 158th street north for two miles to Fort George, however, and from 156th street south to 135th street the subway must be carried through solid rock.

Boring on the tunnel at 158th street will be begun in a few days. This will be done by means of compressed air drills, three or four of which will be operated side by side on a single facing.

Compressed air to operate these drills will be manufactured in a plant which the McCabes will build on a plot of land just north of 162d street, on the west side of the Boulevard Lafayette.

At 168th and 181st streets station shafts are being sunk. The one at 181st street is fifteen by thirty feet and will go down a distance of one hundred and twenty feet. It already has been sunk forty feet. The one at 168th street, which is fifteen by twenty feet, has already been carried down fifty feet, or half its depth.

These shafts are sunk through solid rock from top to bottom, and as soon as they are completed boring on the tunnel to the north and south of them will be begun.

From 133d street to 135th street, where the road will strike underground again after ten blocks of elevated structure across Manhattan valley, there is another excavation in Broadway. This is for the foundation of the two blocks of viaduct in the McCabes' contract, work on which will be begun this week.

But slow progress has been made on the eleventh section, in Broadway from 104th to 125th street. John Shields has the contract for this section, and work on it was begun at 120th street on June 18th. Delay on this section is due to a water main in the middle of the parkway, which will have to be moved out of the way of the tunnel.

The excavation at this point has been carried from 120th street to 122d street the width of the subway, and to a depth varying from one to five feet.

From 122d street to 125th street there is a trench in the middle of the thorougfare about three feet wide, which has been dug down to the water main. As soon as the big pipe has been moved to the west side of the parkway, where a trench is being dug to receive it, a large force of men will be employed and the work will be rushed.

Work on the down town sections has been begun only in Elm street, near Reade street, and in the upper end near Great Jones street. At both of these points there is a noticeable excavation, but nothing like tunnel depth has been reached.

Work on the third section, between Great Jones street and Thirty-third street, will be begun within a few weeks. Holbrook, Cabot and Daly, who have the contract for this section, established fixtures at Seventeenth street and Union Square nearly a month ago, when it was understood the deliveries of iron would begin by August 1.

Owing, however, to the fact that the contractors will not be permitted to keep the roadway in this busy section of Fourth avenue open more than by short sections for a few days at a time, no work has yet been done. As soon as the iron is received the force of men, which was ready for work on August 1, will begin excavations.

The sub-contract for the fifth section, which includes the line from Fourth avenue, through Fory-second street to Broadway, has not yet been awarded. Shopkeepers and residents in the street are very anxious that work at this point be begun without delay, so that the subway may be put in before the street railway company finishes its work and repaves the street.

The work of clearing underground obstructions out of the path of the subway, which has been going on steadily for more than four months, being of a primary character, has enlisted the greater part of the efforts of the construction company thus far.

Good progress, however, has been made in this direction. James Pilkington, who has obtained the contracts for much of this work, has already completed the job on the Bleecker street sewer. Work here was begun on March 26, when Mr. Parsons lifted out the first paving block, and finished on June 21. Sewer constructions have also been completed on Mulberry and Tenth streets.

Work is now being done on the Canal street sewer, the one in Pearl street, the sewer crossing Fourth avenue at Seventh street, the sewer in Twenty-second street, the one in 110th street between Fifth and Lenox avenues, the sewer in 124th street at Lenox avenue and the one in 157th street at Broadway.

Electric Trains for the Manhattan Elevated Railway.

The first electrically equipped train will be run on the Manhattan Elevated Railway of New York as early as September 15, according to a statement by W. E. Baker, superintendent of electrical construction. The engines and generators are now being pushed to completion, and the first engines will have their trial trip on the Second Avenue line in less than four weeks. The change from steam to electricity will cost the company $12,000,000. The total capacity of the new power house will be 64,000 horse-power; the maximum horse-power, exclusive of the storage battery plants, which will be installed at the sub-stations, will be 100,000. The equipment of the trains will consist of two motor-cars, one at each end of a six-car train. The motor-cars will carry four motors of about 100 horse-power, giving the train a total of 800 horse-power. The sub-stations on the east side have already been located at Allen and Division streets, 34th street and 98th street. The first section to be equipped completely will be the Second Avenue line, the reason for this choice being on account of its nearness to the station.

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TO HARNESS THE SUSQUEHANNA.

(From the New York Financier.)

In financial magnitude the prospective plans of the Susquehanna Electric Power Company excel everything heretofore attempted in Baltimore. The company was formed under Maryland laws in 1896, and since that time its experts have been measuring, calculating and estimating in order to make certain that the project then outlined could be realized in fact as well as in theory; it is understood that, after carefully going over the ground and making sure that there is no miscalculation or mistake to frustrate the project, the company has secured the active support of several of the big banking institutions, as well as of a number of prominent Baltimoreans, whose influence and ability are fully equal to the task they have undertaken. This is nothing less than to harness the waters of the Susquehanna River, very much as Niagara is controlled, and by means of dams, head and tail races, immense turbines and whatnot, generate about 40,000 horse-power and transmit it as electricity to Baltimore, whence it will be distributed for operating the street railways, electric lighting plants and manufacturing concerns. The company's work will begin on the Susquehanna near Peach Bottom, Pa., where it has been assured the full 40,000 horse-power can be obtained; the transmitting line will cross York County as nearly as possible in an air line and will be continued through Maryland to the eastern limits of Baltimore, where it will connect with the wires of the United Railway Company. It is said that the railway company already has a forty-year contract for one-half of the power named, and that its use will result in a great saving to that concern in its expenditures for power and allow it to supply electricity for lighting and for power in the smaller manufactories at considerably reduced rates. The payments made by the railway company will cover the power company's operating expenses and provide besides a fund sufficient to discharge the interest on the first issue of bonds. These will amount to $4,000,000, but the company will be capitalized at $12,000,000 and have $8,000,000 in reserve for future developments. The financial details are to be managed by the Continental Trust Company, whose president, S. Davies Warfield, has become deeply interested in the success of the undertaking. The mechanical part of the work is to be done under the supervision of engineers who have the advantage of experience gained in installing the hydraulic and electric plants that are operated by the Niagara. The success of the great enterprise is not doubted by any one competent to give an opinion upon the subject, and the possibilities which must follow the initial introduction of current from this source are sufficient to make enthusiasts of all who are in any manner concerned. The complete development of the plans now outlined will give Baltimore advantages that can hardly be estimated at present.

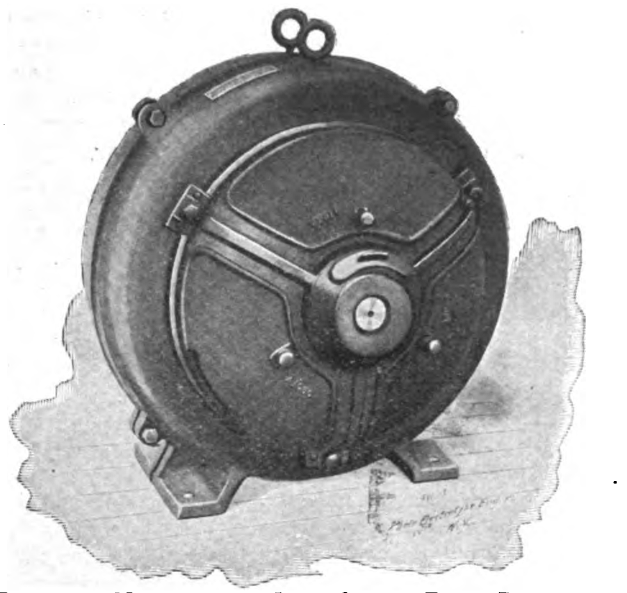
ELECTRIC MOTORS IN THE ART OF PRINTING.

People thought it wonderful when Gutenberg, by hard work, was able to take 300 impressions a day with his printing press. That was about the middle of the fifteenth century. To-day the printing press is a marvel in mechanism, and not only prints the papers, but pastes, folds and counts them at a remarkable rate of speed. The development of the printing press is due largely to the fact that there is no class of business men who are quicker to see the value of an improvement in trade methods than printers and those in the allied trades. The most recent advance is the application of the electric motor to the presses and other machines, and we herewith present some facts and figures to show the advantages of using electric motors and to prove the superiority of electric apparatus.

There is a great saving in the cost of power. The power is used only in proportion to the work done. It is not necessary to supply power for the whole plant when only one press or machine is working. The moment the operator breaks the current and the motor stops, all expense for power immediately ceases. This is an extremely important point with job printers, for a large percentage of time is taken up in the "make ready." By passing the current through a meter, an exact register of the amount of energy consumed may be recorded. This is impossible in case of belts, shafts and pulleys, for the tightness of the belt, the arc of contact and the smoothness of the face of the pulleys are variable quantities and may be one thing this week and another next. The line shaft, no matter how carefully it may have been erected, will soon get out of alignment, caused by the displacement of hangers, or settling of floor and walls. This means another loss of power and useless expense. Mr. George Hill, consulting engineer for the American Book Company, conducted a series of tests at the factory of the Western Electric Company to determine which motor should be recommended for purchase. In this contest, the motors of ten of the best-known manufacturers in the country competed and the Lundell motor won the prize. Efficiency, ability to stand over-load, and price, were the points considered.

Since adopting the Lundell motors in their plant, they have made a saving of 44.2 per cent. in the cost of light and power,

One feature of this application of power is that each press or machine is independent of all others, so that if carelessness or accident should cause one machine to stop, no other will be affected. The other work can go right on.



SIX-POLE ENCLOSED MOTORS WITH SELF-OILING RING, BEARINGS AND REMOVABLE COVERS FOR DIRECT CONNECTION, GEAR OR BELT DRIVING

There are many other objections to the use of belts. Loose belts entail jerky motions; tight belts cause hot bearings: lacings tear out; hangers become unsteady, and oil drips on paper and clothing; pulleys become unbalanced and rattle and the shafting wobbles. The Lundell motor is steady and absolutely reliable, as exemplified in over a thousand presses operated by Lundell motors.

Where belts, shafts and pulleys are used there is a deterioration of stock because of the flying dust and grease, but with the use of the Lundell motor there is nothing of the sort. The floor, walls and ceiling can be kept entirely clean, and there is no loss of light because of the mass of belts, hangers, shafts and pulleys. "The better the light, the quicker the make ready," says the printer.

It is with a deep feeling of relief that one steps from the old-fashioned belt-driven press room into the modern, bright, clean, motor-driven press room.

Fast-flying belts endanger life and limb, and an occasional countershaft torn down is liable to cause serious damage. There is no danger with an electric motor. It is compact and simple, and requires no technical knowledge on the part of the operator. The pressing of

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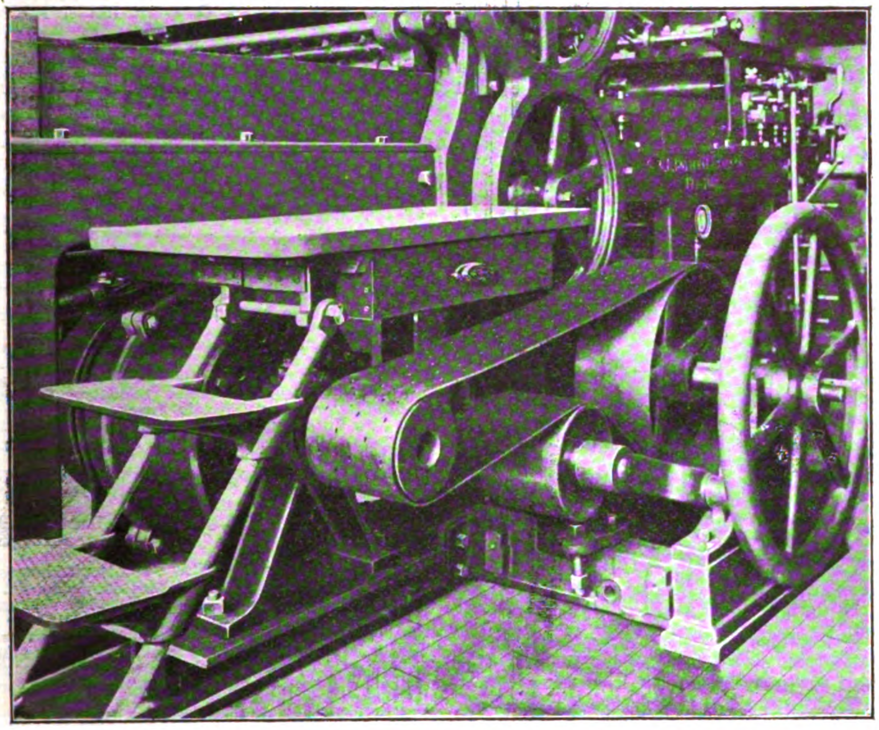
a button or the turning of a handle is all that is necessary.

Equipping presses with electric motors permits the presses to be arranged and placed to the best advantage and results in economy of floor space, with better light and air. The Lundell motor is of such compact design that it occupies less floor space than any motor of the same power on the market.

Each press or machine is under the absolute control of the operator. The controlling apparatus supplied may be of either of two kinds. For the large machines, requiring large motors, and where the variations of speeds must be very exact and minutely subdivided, a rotary form of armature controller with a separate field rheostat is supplied. This rotary controller is of the cylinder type, made very heavy, and is similar in appearance to the ordinary street car controller. The controllers are arranged to give from five to nine forward, and from two to nine reverse running positions.



FIVE HORSE-POWER LUNDELL MOTOR BELTED TO NO. 10 COTTRELL PRESS.

The field rheostat, being independent of this main controller, can be used to give twenty or more intermediate speeds between each running position of the main controller, so that the operator can readily procure from 100 to 180 operative speeds in a forward position, and from 40 to 180 in a reverse direction, depending upon size and type of controller used.

This makes it possible to select the exact speed most suitable for any purpose.

This form of equipment can also be supplied with an automatic over and underload circuit breaker, which protects the machine from overloading, and cuts off current when the supply is interrupted.

For intermediate and small work, a simpler controller is used which consists of an armature and field rheostat controlled by a single lever. This device is fitted with an automatic release which cuts off current in case of overload or in case of interruption of the current.

The number of speeds obtained for this type of controller vary from ten to fifteen forward, and two to four reverse speeds.

Both forms of controllers, are fitted with renewable contacts, the very highest grade of insulation, and are arranged to prevent burning of contacts or injurious arcing.

The motors are steel clad and completely enclosed, making them practically dust and waterproof, protecting the working parts from injury which might be caused by an accumulation of dust, or the careless dropping of a hammer, or wrench, or other object. As constructed these motors are practically invulnerable to accidents or injury.

THE ELECTRICAL EQUIPMENT OF THE R. & H SIMON CO. SILK MILLS, UNION HILL, N. J.

The application of electricity to various uses in mills and factories is increasing with such regular and lengthy strides that it has become one of the distinctive problems of electrical engineering, and the subject is one of such interest to many, that a brief description of the following individual case will be worthy of notice.

The plant under consideration is that of the R. & H. Simon Co., silk manufacturers, on Gardner street, Union Hill, New Jersey.

The conditions to be met were similar to those arising in many mills during these years of constantly increasing business. A large addition was to be made to the buildings, and this addition was to be supplied with light and power. The two horizontal engines, one of 150 hp., and the other of 75 hp., were used for driving the shafting throughout the mill, as well as the generators which supplied current for lighting the buildings. The steam plant was already loaded well up to its limit during the early morning and late afternoon, and the engine room afforded no space for the installation of additional units.

These facts led to the consideration of a storage battery, and immediately it became apparent that a battery would not only obviate these difficulties, but would add many advantages to the electric and power equipment. Thus it was seen, that the installation of more steam apparatus would require the firing of an extra boiler twice a day, for one or two hours only, in the morning and afternoon, when the maximum loads occurred. Were a battery used, however, the surplus energy during the hours of light load could be stored and used to assist the generators when the peak loads came on. The large saving in fuel accomplished by this method formed another strong argument in favor of the battery.

Then, too, it was apparent that a battery meant electric service at any time during the twenty-four hours. This feature fell right in step with the proposed installation of motors throughout the mill to supplant the shafting. Thus it would be possible to run a machine here or there after working hours, without the necessity of running the engines, or wasting energy in driving idle shafting. The steam plant could shut down and the engine and boiler room force go home when the whistle was blown, and yet power and light could be supplied for various machines. The office also could be lighted up after hours.

Another argument in its favor arose from the desire of Mr. Simon to run wires from the

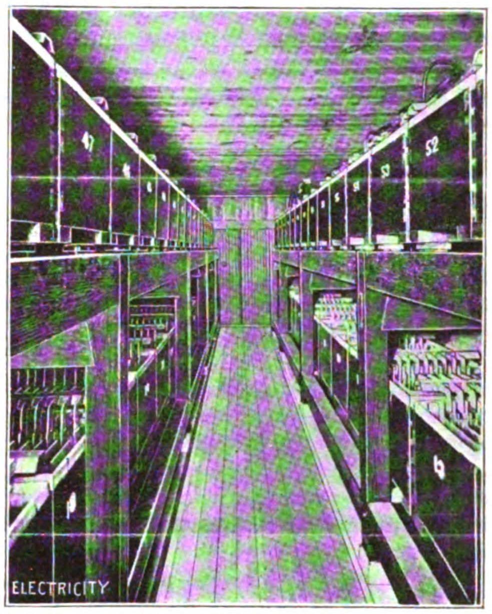


FIG. 1.—SIXTY-FOUR CELL STORAGE BATTERY.

battery to his residence, which is in the immediate neighborhood, and thus obtain light both day and night.

Finally, as one last inducement for the installation, it was taken into consideration that the battery would stand behind the generating machinery as a reserve in case of accident.

With these facts in mind, it was decided to install a battery, and as a result the R. & H. Simon Co. now possesses an isolated plant modern in every particular and one whose flexibility leaves little to be desired. All the advantages expected from the installation of this plant have materialized. The battery has given complete satisfaction on the different classes of service for which it was designed.

The battery (Fig. 1) was installed by the Electric Storage Battery Company, of Philadelphia, and consists of 64 cells of 640 ampere hour capacity, the voltage being 110. Each cell consists of 17 plates 10½ inches square, suspended in acid contained in lead-lined wooden tanks, having outside dimensions of 21¾ inches wide, 15 inches long and 17¾ inches high. These cells are mounted upon two parallel wooden racks, each rack supporting two tiers of 16 cells each. The battery occupies

a room to itself next to the engine room. By means of a cable it is connected to the battery switchboard and to a small belt-driven booster.

LEGAL NOTES.

Judge Martin Bell, of Blair County, Pa., recently rendered a decision of importance upon the rights of the majority and minority stockholders in a corporation. Fifty-three per cent. of the capital stock of the Edison Electric Illuminating Company of Altoona, Pa., is owned by the Electric Company of Philadelphia, Colonel A. Loudon Snowden, Joseph B. McCall and other Philadelphia capitalists. Forty-seven per cent. of the capital stock is owned by Altoona capitalists. The minority stockholders, who were in control of the company, sought to issue 650 shares of new stock and auction the same to the highest bidder. The Philadelphia capitalists secured an injunction, alleging that their rights as majority stockholders were being endangered by this procedure. The Court made the injunction perpetual, holding that majority stockholders have a right to a majority of new stock at a fair market value, so as to preserve their control, and that the tendency of auctioning stock is to give the minority an unfair advantage over the majority. The electric plant in dispute is valued at $1,000,000.

CANADIAN NOTES.

The Cataract Power Company, of Hamilton, Ont., has made a proposition to the council of that city involving the construction of an electric railway from Hamilton to the cities of Galt and Guelph, Ont.

It is reported that the B. C. Gold Mine, Summit Camp, British Columbia, has purchased the water-power at Cascade. The power is being developed by the Cascade Water and Light Company. The falls are capable of developing 20,000 horse-power. The principal owners of the B. C. Mine are Jas. Ross and C. J. McCuaig, Montreal.

Mr. R. J. Parke, consulting engineer of Toronto, has been engaged by the municipal council of St. Mary's, Ont., to prepare plans and specifications for the reorganization and combination of the present municipal arc lighting plant and the incandescent lighting plant recently acquired by the town from the Reesor Company. A new power station will be erected and a completely new engine and boiler plant purchased and installed.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended August 18:

Antwerp, 24 packages, $2,770; Brazil, 92 packages, $9,871; British Possessions in Africa, 12 cases, $1,476; 12 packages, $1,713; British West Indies, 16 packages, $268; Brussels, 1 package, $246; Canary Islands, 48 cases, $327; Central America, 50 cases, $813; Chili, 13 cases, $474; Christiana, 6 cases, $550; Cologne, 12 cases, $605; Copenhagen, 11 cases electric motors, $413; Cuba, 31 cases, $892; Dundee, 8 cases, $1,052; Ecuador, 3 cases, $66; Genoa, 5 cases, $110; Hamburg, 171 packages, $10,456; Havre, 77 cases, $9,923; Hayti, 2 packages $13; Huddersfield, 11 packages motor trucks, $2,189; Hull, 22 cases electric motors, $3,885; Japan, 2 cases, $170; Liverpool, 112 packages, $6,738; 150 cases motors, $9,656; 5 cases, $210; London, 337 packages, $15,094; 38 packages motors, $1,900; 30 cases trolley poles, $950; 1 case, $92; Marseilles, 23 cases, $1,944; 17 cases motors and parts, $2,000; Mexico, 60 cases, $1,416; 2 reels cable, $477; Newcastle, 52 cases, $7,000; Newfoundland, 10 cases, $313; Norwich, 1 case, $18; Nova Scotia, 3 packages, $35; Peru, 15 cases, $573. Plymouth, 1 case, $5; Porto Rico, 59 packages, $5,916; Rome, 1 package insulators, $8; Santo Domingo, 17 cases, $274; Siam, 3 packages, $426; Southampton, 25 cases, $1,390; St. Petersburg, 1 box electric motors, $135; 35 cases, $3,123; Venezuela, 51 boxes, $138; Wiborg, 68 packages, $1,282.

PERSONAL MENTION.

Dr. L. E. Niles, president of the National Electro Magneto Telegraph Company of Springfield, O., has returned from New York, where he has been making arrangements looking to the organization of a construction company which will manufacture Inventor L. G. Woolley's apparatus for telegraphing without batteries.

Hon. Benj. B. Odell, Jr., was recently elected president of the Consolidated Gas, Electric Light, Heat & Power Company of Newburg, N. Y.

Mr. John Marsden Ward, agent of the Shah of Persia, is now in this country examining the electric trolley systems of Greater New York preparatory to introducing electric travel between Teheran and a port on the Caspian Sea.

Mr. Eugene S. Apgar, having spent two years abroad as electrician for the Moss Electric Company of Boston, recently returned to his home in New Haven, Conn.

INCORPORATIONS.

The Bruckner Electric Company of New York City. Capital stock, $50,000. Directors: F. C. Bruckner and Paul Sheldon, of New York City, and W. L. Eastman of Woodside, L. I.

The American Electrical Amusement Company, Riverside, N. J. Capital stock, $1,000,000. Incorporators: F. Schwabenland, of Riverside; P. Morris and G. Richards, both of Philadelphia, Pa.

The Williams Electric, Steam & Water Gauge Company, East Orange, N. J. Capital stock, $125,000. Incorporators: Frederick Williams, Charles L. Abbott, Alfred R. Fulton and John W. Brittan.

The South San Francisco Power & Light Company. South San Francisco, Cal.—to furnish electricity. Capital stock, $50,000 Incorporators: L. Hough, W. Clayton, J. W. Lilienthal, W. J. Martin and W. E. Dennison, all of San Francisco.

The Philadelphia Electrical Banjo Company, Newark, N. J. Capital stock, $30,000. Frank T. Creamer, of Newark, is president and treasurer; Samuel Sweet, of Long Branch, secretary. The officers and Fannie M. Bird are the incorporators.

The Electrical Maintenance & Inspection Company, Camden, N. J.—to inspect and maintain electrical devices, especially watchmen's clocks. Capital stock, $10,000. Incorporators: W. J. Caves, G. P. Steel, John Allen and Clifton P. Cornwell.

The Chillicothe Construction Company, Chillicothe, O.—to manufacture and build electric railways. Capital stock, $10,000. Incorporators: O. F. Dillman, J. M. Tomlinson, S. K. Pine, G. K. Cetone and J. K. Newcomer.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED AUGUST 14, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

656,029. Electric Automatic Controller and Indicator for Railways. Vito Leto, Newark, N. J. Filed Sept. 14, 1899.

656,030. Trolley for Electrically-Driven Vehicles. Louis Lombard-Gerin, Lyons, France. Filed Jan. 9, 1900.

656,125. Bond for Track-Rails. Henry F. A. Kleinschmidt, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 28, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

655,762. Insulated Hanger for Arc Lamps. George Cutter, Chicago, Ill., assignor to the George Cutter Company, same place. Filed May 4, 1900.

655,808. Electric-Arc Lamp. Bernard A. Stowe, Cleveland, O., assignor to the Jandus Electric Company, same place. Filed July 10, 1899.

656,077. Manufacture of Incandescent Materials for Electric Lighting. Georg Alefeld, Darmstadt, Germany, assignor to Ludwig Wilhelm Gans, Frankfort-on-the-Main, Germany. Filed June 15, 1899.

656,115. Incandescent Lamp. Christian Hoelscher, Warren, O. Filed May 30, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

655,703. Device for Registering Electric Currents. Victor G. Fuller, Toulon, Ill. Filed Dec. 16, 1899.

655,852. Electric Motor. Patrick J. Collins, Scranton, Pa., assignor to the Collins Electric Vehicle Company, same place. Filed Dec. 1, 1899.

656,105. Circuit-Breaker. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 1, 1899.

656,127. Dynamo-Electric Machine. John D. Spence, Somerville, Mass., assignor to Charles L. Cotton, Dedham, Mass. Filed May 12, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

655,726. Telephone Receiver. William J. Murdock, Boston, Mass. Filed April 11, 1900.

655,772. Telephone Toll Apparatus. William A. Foss, Cleveland, O., assignor to the American Toll Telephone Company, same place. Filed Feb. 26, 1900.

655,810-655,811. Telephone Exchange System. Alfred Stromberg and William M. Davis, Chicago, Ill., assignors to the Stromberg-Carlson Telephone Manufacturing Company, same place. Filed April 26, 1899, July 13, 1899.

655,849. Telephone Bell Cut-Out. Luther F. Cobb, Providence, R. I. Filed Jan. 6, 1900.

655,916. System for Individual Service on Electrical Party-Lines. William Torst, Jr., Los Angeles, Cal., assignor of one half to William P. Mooney, San. Pedro, Cal. Filed Sept. 25, 1899.

655,992. Indicating-Device for Telephone-Receivers. William R. Rathvon, Florence, Col. Filed Nov. 28, 1899.

MISCELLANEOUS.

655,716. Telegraphic Relay. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899. Renewed Dec. 21, 1899.

655,747. Electromedical Vacuum Apparatus. George W. Winckfield, Alameda, Cal., assignor of one fourth to George C. Fabens, same place. Filed Nov. 29, 1899.

655,763. Annunciator. William M. Davis, Chicago, Ill., assignor to the Stromberg Carlson Telephone Manufacturing Company. Filed Dec. 15, 1899.

655,769. Storage Battery. George A. Ford, Cleveland, O. Filed Sept. 5, 1895.

655,777. Electrical Sign and Signal and Apparatus for Operating Same. Anatole Heiny, San Francisco, Cal., assignor of two-thirds to Joseph E. Artigues and Dominique G. Lucien, same place. Filed Sept. 26, 1899.

655,779. Control of Electric Furnaces. William S. Horry, New York City, assignor to the Union Carbide Company, Niagara Falls, N. Y. Filed Feb. 21, 1899. Renewed Jan. 15, 1900.

655,780. Electric Furnace. William S. Horry, New York City, assignor to the Union Carbide Company, Chicago, Ill. Filed Aug. 15, 1899.

655,783. Electrolytic Apparatus for Decomposing Metallic Salts. Carl Kellner, Vienna, Austria-Hungary. Filed March 3, 1896.

655,809. Signaling Apparatus and Circuit Therefor. Alfred Stromberg and Androv Carlson, Chicago, Ill., assignors to the Stromberg-Carlson Telephone Manufacturing Company, same place. Filed April 26, 1899.

655,824. Brush-Holder. Hermann F. T. Erben and William B. Potter, Schenectady, N. Y., assignors to the General Electric Company of New York. Filed Aug. 29, 1898.

655,838. Method of Insulating Electric Conductors. Nikola Tesla, New York City. Filed June 15, 1900.

655,883. Receptacle for Secondary Batteries. Joseph Middleby, Jr., Malden, Mass., assignor of one half to George E. Hatch, Quincy, Mass. Filed April 24, 1900.

655,905. Wire-Joint and Method of Manufacturing Same. Francis W. Maxstadt, Chicago, Ill. Filed June 11, 1900.

655,968. Voltaic Cell. Eugene M. Fishell, Cleveland, O., assignor to the National Carbon Company, same place. Filed Jan. 20, 1900.

656,004. Automatic Resistance-Reducing Device. George H. Whittingham, Baltimore, Md. Filed Dec. 4, 1897.

656,012. Electric Launch. Jacob C. Chamberlain, New York City. Filed March 27, 1899.

656,076. Method of Electrostatically Measuring Currents in Working Circuits. George L. Addenbrooke, London, England. Filed May 7, 1900.

656,091. Electrically Operated Railway-Gate. George D. Burton, Boston, Mass., and George W. Steiner, New York City. Filed April 22, 1899.

656,095. Plate for Secondary Batteries. John B. Conrad, Chicago, Ill., assignor to the Hewitt-Lindstrom Motor Company, same place. Filed March 9, 1900.

656,100. Electricity-Meter. Paul Eibig, Berlin, Germany, assignor to Martin Behrendt, same place. Filed Jan. 20, 1900.

656,128. Method of Regulating Dynamo-Electric Machines. John D. Spence, Somerville, Mass., assignor to Charles L. Cotton, Dedham, Mass. Original application filed May 12, 1899. Divided and this application filed Jan. 22, 1900.

656,156. Method of Producing Carbid of Calcium, etc. William S. Horry, New York City. Filed March 4, 1899. Renewed Jan. 15, 1900.

COMMERCIAL PARAGRAPH.

Dixon's Silica-Graphite Paint has been known and used for nearly forty years—each year better known and each year more largely used. Those who have used it once will use it again, and at all times recommend it. As a protective paint it is without an equal—an ideal and practically indestructible pigment ground in pure, fire-boiled linseed oil of the best quality, and that only. Insist on having Dixon's Ready Mixed Silica-Graphite Paint. Don't let your dealer or your painter mix it for you, as not one dealer or painter in ten can supply an oil of the same quality.

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THE TELEPHONE WORLD.

Indiana's Inter-State Telephone Association.

The convention of the independent telephone lines in Terre Haute is said by those attending to have been the most enthusiastic session of the Inter-State Telephone Association yet held. The main result of the convention was that an understanding was reached for a basis by which all the independent lines are to have connection and there is to be a free interchange of business, which means that Terre Haute is to be connected directly with 500 towns in Indiana and Illinois. Representatives were present from the independent telephone exchanges at Chrisman, Rockville, Casey, Danville, Hume, Clinton, Ridge Farm, Oakland, Kansas, Marshall, Greencastle and Mattoon. By the building of a line to Marshall, which is to be done, Terre Haute in the next year will be strictly in it so far as independent telephone service is concerned. General Manager Colt of the Citizens' Telephone Company is quite happy over the outlook, as it means much for his company in the way of outside connections.

The Kinloch Long Distance Telephone Company is now building a line from St. Louis to Indianapolis through Terre Haute and this will also be connected with the independent telephone companies. A company at Indianapolis is building one to Cleveland and Buffalo, and independent exchanges are being put in at Philadelphia, Baltimore, New York and Boston, with which, when the circuit is finished, Terre Haute will be connected.

The independent company at St. Louis has communication as far west as Kansas City and St. Joe so that to the west the Terre Haute Independent Company will be right in it when the line is completed from St. Louis to Terre Haute. In going through Terre Haute the Kinloch Company will use the wires of the Citizens' Telephone Company. The vast circuit that is being created independent of the Bell Company will be plain at a glance.

The Citizens' Telephone Company is having a new switchboard made by the American Electric Telephone Company of Chicago, which will serve 3,000 subscribers.

The officers of the Inter-State Telephone Association are: President, C. R. Duflin; secretary, H. A. Colt; treasurer, J. B. Connelly, of Rockville.

Secretary Ware of the Citizens' Telephone Company of Grand Rapids, Mich., recently made a trip to Jackson, Mich., in the interest of the independent companies. While in Jackson he heard of the combining of the Ann Arbor independent company with the Michigan Company. Mr. Ware went to Ann Arbor to look over the situation and found rather peculiar circumstances. The independent company of Ann Arbor which had more 'phones than the Michigan Company was sold out by the Detroit stockholders to the Michigan Company, and Manager Keech of the Michigan Company was made manager of both exchanges. It is now intended to consolidate the exchanges by replacing the independent telephone by the Bell 'phone at the same exchange rate. Mr. Ware says, however, that the change of 'phones cannot be made legally. If the Ann Arbor people should decide to retain their independent telephones, the Michigan Company would be compelled to leave them, as a State law forbids a change unless the person having the 'phone permits it.

The Fluvanna Telephone & Telegraph Company of Palmyra, Va., now has connection with the Louisa Telephone Company, and also long distance connection with Richmond. The company is now building an extension line to connect with the Albermarle telephone, which is hoped to be completed in thirty days. When this line is finished it will give connection to Charlottesville and Albermarle County. Although the Fluvanna Company is only about a year old, yet it has fairly covered the county with lines, has equipped a nice exchange, and has one of the best-constructed systems in Virginia.

The Northeastern Pennsylvania Telephone Company of the borough of Thompson, Susquehanna County, Pa., has been chartered with a capital of $16,000 to construct telephone lines in the counties of Susquehanna, Wayne and Lackawanna. The directors are A. H. Crosier, S. S. Hubbard of Thompson, W. W. Munford of Starrucca, H. W. Kessler of Brandt, and F. E. Osgood of Forest City.

J. W. Martin, manager of the Oakland County Telephone Company, has made a proposition to build and equip an independent telephone system in Pontiac, Mich., with State connections and first-class service at the same rates that were charged by the Detroit company, and he will have the line in operation in six months.

Subscriptions for a new telephone system to compete with the Wisconsin Telephone Company have been raised in part, $30,000 of $60,000 being assured. The new company, to be known as the Racine Mutual Telephone Company, will soon be incorporated.

An automatic telephone pay station has been installed in the Hamburg-American line steamship Augusta Victoria, at the pier in Hoboken, N. J. All that is necessary to be done to connect the steamer with the telephone system is to insert a plug in its proper place on the deck. This is the work of a second. No attention from the telephone company's employes is required. The connection is made with the Hoboken central office. The system gives passengers leaving for Europe opportunity to transact business up to the very moment of sailing, as it is designed to disconnect the telephone at the same moment the lines are cast off. If the scheme works well similar stations will be placed on the other steamers of the Hamburg-American line.

The franchise of the Citizens' Telephone & Telegraph Company of Worcester, Mass., is in the hands of City Solicitor A. P. Rugg, who will prepare it in connection with the committee appointed from the board of aldermen. There has been some talk of running the wires of the new company through the conduits of the New England Telephone & Telegraph Company, in order to avoid the necessity of digging up the streets again. There is some question, however, as to whether the New England Company could be forced by the aldermen to allow a competing line to use its conduits in this manner. It is also doubtful as to whether there would be enough room in the New England's conduits for all the wires the new company will use. One thing is fairly certain, very few wires will be strung overhead by the new company.

At the meeting of the International Railway Congress, which is to be held in Paris, the subject of the use of telephones on railroads will be taken up and discussed. The following resolution is to be presented: "Provided that very simple precautions in the transmission and registration of messages are taken, the telephone affords at least an equal guarantee of safety to that of the telegraph in the exchange of messages peculiar to railway working, that is to say, messages effecting the safety of running the trains. Its advantages or disadvantages as compared with the telegraph, in convenience and economy, depend upon conditions which are peculiar not only to each railway, but even to each branch, for they depend, not only on the magnitude of the traffic, but on the existing telegraph, electric light and electric power mains."

The final organization of the Clark Automatic Switchboard Company for the manufacture and sale of the telephone switchboard invented by Manager Clark of the Iowa Telephone Company in Sioux City, Ia., and perfected by John Van Wagenen, was recently effected. The organization meeting was held at Providence, R. I., and the following officers were elected: President, William B. Banigan; vice president and general manager, E. M. Prindle; secretary, F. A. Seib; treasurer, M. E. Torrey; directors: William B. Banigan, E. M. Prindle, J. Van Wagenen, M. E. Torrey and J. W. Phillips.

The long distance telephone system of Vicksburg, Miss., along the main line of the Yazoo and Mississippi Valley, north and on the Riverside division will be completed to Greenville, Miss., in a few days. The completion of these lines means telephone connection with every point on the river north of Vicksburg on the Mississippi River to New Orleans, and all points north as high as Memphis. The service is spreading to all the interior towns.

H. R. Godfrey is preparing to put in a long distance telephone system that will connect Scottsboro, Ala., direct with Ft. Payne, Collinsville, Chattanooga and many other towns in that section. The long distance line is now built within twelve miles of Scottsboro on Sand Mountain, and will be taken to that place by cable through the Tennessee River. Mr. Godfrey is arranging to establish a local system.

By the action of the stockholders of the Home Telephone Company of Greenville, S. C., the sale of the plant to the Consolidated Telephone Company of South Carolina was confirmed. By this action the Home Telephone Company ceases to be an independent company. George A. Browning, president of the Home Company, has been elected president of the Consolidated Company.

Carthage will soon be the center of the strongest interurban telephone system in Missouri, as arrangements have been made to connect the Pierce City lines, recently purchased by T. J. Hyman of Chicago, with the Springfield and Monet and the Pierce City and Reed's line with the Carthage exchange. When completed, the accommodation afforded the mining regions will not be surpassed anywhere.

The Cumberland Telephone & Telegraph Company has completed a telephone line from Springfield to Turnersville, Tenn., and Springfield is now in touch with almost every part of Robertson County.

The people of Ainsworth, Ia., are quite enthusiastic over telephones. M. L. Miller and J. A. Marsh of that place have organized a company for the purpose of giving the farmers of Oregon and Highland townships a complete service with a central office at Ainsworth. They have been working it up, and have gone in three directions from town, southeast, southwest and northwest. These three will be in conjunction with the line already running northeast. They have secured sixty-five 'phones on the three new lines and in the town of Ainsworth. These in connection with the line already organized with fifteen 'phones will make a central in Ainsworth with eighty 'phones.

The finishing touches on the new telephone line of the Missouri & Kansas Company have been made between Wichita and Haven, Kan., and communication is now open. This line was commenced to Hutchinson in order to accommodate the small towns between Wichita and that point, and from which the company will obtain considerable revenue. This company already has one line to Hutchinson, but the new enterprise will open up a vast amount of undeveloped territory. The work from Haven on to Hutchinson, Kan., is continuing, a force of men being at work all the time. It is the intention to have it finished by September 1st.

The farmers between Randolph and Imogene, Ia., are agitating the question of establishing a telephone line, the proposed line to run south and east from Randolph to Fred Anthony's farm, and thence into Imogene. If this is consummated the farmers southwest of Imogene are quite likely to be possessed of two modern utilities soon, as all applications for free rural delivery routes on file will be acted upon immediately, and the routes granted, if conditions for the routes are satisfactory.

With the installation of the switchboard in the new central office at Two Harbors, Minn., and the completion to Duluth of the Duluth & Iron Range Railway Company's new telephone line, connection can now be had with Minneapolis, St. Paul and Chicago over the Bell Telephone Company's lines from Duluth. The Iron Range system is nearly completed to Biwabik, Minn., and as soon as the switchboard is put in there to connect with the Mesaba Telephone Company's line, Virginia, Biwabik, McKinley, Sparta, Eveleth and Mountain Iron will also enjoy the same connections.

At the annual meeting of the Citizens' Standard Telephone Company at Kingston, N. Y., on the 16th inst., the following were elected directors: John H. Farrell, John M. Bailey, James H. Leake, Jay E. Klock, T. E. T. Mosher, S. N. Frederick, and Cornelius Hill. The officers chosen were John H. Farrell, Albany, president; Jay E. Klock, Kingston, vice-president; James H. Leake, Albany, treasurer; T. E. T. Mosher, Albany, secretary.

It is stated that the Central Railroad of New Jersey and the New York & New Jersey Telephone Company are at loggerheads in Dunellen, N. J., with the result that the extension of the telephone line to New Market has been held up. The railroad company objects to the telephone company's setting poles and stringing wires on property owned by the road. Some poles that had been set were removed.

The Southwestern telephone exchange of Bastrop, Tex., which has been under headway for the last two months, now complete. The town is equipped with a large number of wires. It will be connected with the long distance telephone.

The Tidewater Telephone Company, which has just completed a line from Gloucester Point to Newport News, Va., will now construct a line from Gloucester Point to Tappahannock, Va.

The telephone company has extended its line to Wardlan and Davis Mill, seven miles south of Warren, Ark., and it is proving a great convenience to persons in that vicinity.

The Northwestern Telephone Company of Hastings, Minn., has had its long distance lines connected with the local exchange.

The Bell Telephone Company is erecting a new line from New Wilmington to Volant and Neshannock Falls, Pa.

TELEPHONE INCORPORATIONS.

The West Jefferson Telephone Company, West Jefferson O. Capital stock, $6,000.

The Kandiyohi Telephone Company, St. Paul, Minn. Capital stock, $10,000. Incorporators: P. J. Haley, A. F. Hanscom, J. M. Spicer, J. O. Lundberg and H. B. Eddy.

The Co-operative Telephone Company, Dresden Station, N. Y. Capital stock, $15,000. Directors: R. N. Clemons, Dresden Station; J. A. McLaughlin, Putnam; E. J. Gray, Whitehall.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Bellevue, Ia.—Bellevue will expend about $4,000 on its electric light plant.

Binghamton, N. Y.—A special session of the board of supervisors was held lately, the meeting being called by the committee on county buildings for the purpose of considering the plans and specifications for a steam and electric light plant at the county farm.

Cadillac, Mich.—Extensive improvements are in progress at the Cummer electric light and waterworks plant here.

Chattanooga, Tenn.—The new Southern Hotel of which F. A. Lincoln is manager, will soon be in the market for an electric light plant of about 700 lights.

Corunna, Mich.—A corporation will be organized in this city to be known as the Shiawassee Light & Power Company; the incorporators are to be the present members of the Corunna Electric Company, and H. A. Sprague of Portland. The new concern will be capitalized at $20,000, and work will be commenced at once on the new plant which will be located at Shiawassee.

Covington, Ky.—The question of issuing $50,000 in bonds for erecting an electric light plant will be voted on at the November election.

Dothan, Ala.—H. A. Pearce, mayor, wants bids for material and the construction of an electric light plant of 1,500 incandescent light capacity.

Durand, Mich.—This place is to have an electric light plant.

Fargo, N. D.—The Courtenay mills will have an electric light plant.

Fullerton, Neb.—An electric light franchise has been granted to a Lincoln firm, and it is expected that a plant will be put in soon.

Grass Valley, Cal.—The Electric Power & Light Company's plant was recently destroyed by fire. Loss $2,000.

Hill City, Tenn.—The people here are very anxious to secure waterworks and electric lights.

Hull, Que.—The question of municipal ownership of the electric lighting plant is being revived here, and it will probably be brought to a successful issue.

Iron River, Wis.—The electric lighting plant here was destroyed by fire recently.

Leesville, La.—An electric light plant will be built for the town's supply.

Lenni Mills, Pa.—Wm. Carson & Co. are installing an electric light plant in Parkmount Mill at this place for the purpose of lighting that mill as well as the Brookside Mill nearby. It will be in operation by October 1.

Loveland, Col.—This town is advertising for bids for an electric light plant.

Mattoon, Ill.—A new dynamo, costing $2,350, is to be installed into the electric light plant at this place.

Mora, Minn.—The Morrison electric light plant was recently purchased by the Mora Milling Company, and will be removed at once, and operated in connection with the mill.

Morrice, Mich.—The electric lighting plant destroyed by fire here some time ago is to be rebuilt at once.

Nanuet, N.Y.—There is talk of having electric lights in this town.

Napoleon, O.—The electric light plant here was recently destroyed by fire.

Nelson, B. C.—This city will sell, September 15, $15,000 in bonds for extending the electric lighting system. J. Houston, mayor.

Neoga, Ill.—Bids will soon be advertised for the erection of an electric light plant. J. D. Wallace, engineer, Champaign.

Newmarket, Ont.—A special election will shortly be held to vote on the question of issuing $10,000 in bonds to build an electric light plant and waterworks.

Palestine, Ill.—The village board has contracted with the Chicago Commercial Electrical Company to put in an electric light plant, with a 125 horse power boiler, a 100 horse power engine and a 1,200 light dynamo.

Penacook, N. H.—The Dustin Island Woollen Mills will put in at once an electric plant of 300 horse power capacity. With the electricity generated the mills will be lighted and power furnished for the extra demands upon the mills.

Radford, Va.—Bids will be received until September 1 for enlarging the plant of the Radford Electric Light & Power Company so as to operate about 100 2,000 cp. arc, and 3,000 16 cp. incandescent lights to cost about $20,000. Address F. S. Pickle, secretary.

Rhinebeck, N. Y.—A first class electric plant is now an assured fact here.

Riverside, Cal.—An electric light plant will soon be built by this city. Messrs. Morse and Peters are investigating as to cost, etc.

Shelby, Ala.—The Shelby Iron Company will erect an electric light plant at its works.

Spirit Lake, Ia.—B. F. Stevens, of St. Louis, has made Spirit Lake a present of an electric light plant.

St. Joseph, Mich.—The city council has unanimously passed a resolution authorizing the ordinance committee to ascertain about the cost and construction of an electric lighting plant.

St. Mary's, Ont.—An engineer has been appointed to prepare plans for the proposed new electric light plant and bids will be asked for soon.

Tamaqua, Pa.—Bids will be received by the town council until September 5 to light the village. Any practical street lighting system will be considered. Address W. F. Leopold, town clerk.

Wellsburg, W. Va.—The Wellsburg Electric Light Company proposes in the near future to rewire the town and place a new 100 power engine in its plant, so as to be able to furnish current day and night.

Westwood, N. J.—The electric light plant is to have a new engine of greater capacity than the old.

West Lafayette, Ind.—The light committee of the city met recently at the call of Chairman Manning to consider the matter of lighting the city with electricity. The committee will report at the next meeting of council when it is expected the matter will be finally disposed of.

Wrightsville, Ga.—This city has voted in favor of the proposed issuance of $15,000 for erecting an electric light plant.

STREET RAILWAYS.

Albany, N. Y.—It is stated that an agreement has been made between the United Traction Company and the Schenectady Railway Company by which the latter will construct a trolley line to this city.

Ashland, Pa.—The matter of constructing a trolley line from here to the State Hospital, and which will eventually reach Gordon, is being considered by certain men who build railroads.

Austin, Tex.—I. B. Crearer, F. H. Fitch and Judge A. G. Mosely of Denison were here lately in consultation with Attorney General Smith with a view of securing a charter for a corporation to construct an electric road between Denison and Sherman.

Black Hawk, Col.—The wire for the electric trolley system of the Boston and Denver Mining & Milling Company has been received and the trolley poles wired. The electric motor, which is now in place, has enabled ore cars to pass through the Bobtail and Bates hill tunnel to the company's new mill.

Caldwell, N. Y.—At a recent conference between the highway commissioners and those interested in the construction of the proposed electric road between Warrensburg and this place, it was decided to run a new line through the northern part of this town, which is believed to be more beneficial to a larger number than the proposed route.

Chattanooga, Tenn.—The Chattanooga Electric Railway Company has decided to extend its line to Sherman Heights. D. W. Warner is president of the company.

Chester, Pa.—It is said the arrangements for the construction of the trolley line from this city to Essington are about finished and the work will be started in the near future.

Dayton, O.—It is stated that the Dayton, Springfield & Urbana Electric Railway Company's plant may be purchased by the American Railway Company of Philadelphia, which owns the Springfield railway system.

East Hampton, Conn.—One of the features of the new electric road between here and Moodus will be the moving of freight.

Lapeer, Mich.—R. G. Hart and W. G. Brown of this city have assigned their interests in the Detroit, Oxford, Lapeer & North Branch Electric Railway to Daniel R. Currey of Rochester and Ed. S. Grece of Detroit, who say they will push the road to completion at once.

Marion, Ind.—Engineers have been started out over the right of way of the proposed electric railway between Hicksville, O., and this city passing through Ft. Wayne and Huntington.

Martinez, Cal.—The board of supervisors of Contra Costa County recently granted to A. S. Macdonald and W. G. Henshaw, of Oakland, a franchise for an electric road from Point Richmond to the Alameda County line. Work on the construction of the road will begin at once.

Meriden, Conn.—Rus Williams of this city has a plan for equipping the Waterbury railroad with electricity, which would save it $15,000, he says, and add to the receipts at least $1,000 a year.

Montgomery, Ala.—F. C. Ayres is interested in a proposed electric line in the suburbs of Montgomery.

Morristown, Ind.—The town trustees recently granted a right of way to the Indianapolis, Morristown & Rushville Electric Railway Company for a line to this city from Indianapolis. Work is to begin in six months.

Muncie, Ind.—J. M. Gore is the promoter of the right of way of the Indiana & Ohio electric road between this city and Portland.

Pittsburg, Pa.—The extension of the Westmoreland street railway trolley line from Manor to this city is an assured fact.

Ravenna, O.—The council lately granted a franchise to the Portage Lakes Traction Company to construct an electric railroad here. It is conditional that the line be extended to Cleveland and Kent before December 31, 1901, or the grant becomes forfeited.

Ripon, Wis.—The council has acted favorably on a petition of Chicago capitalists for the construction of an electric line to the north and south shores of Green Lake. The line will be ready next spring.

Rochester, N. Y.—The promoters of the Buffalo, Niagara Falls & Rochester Electric Railway have secured the necessary rights of way and the company will apply for permission from the State Railway Commission to begin the construction of the road. Articles of incorporation have been prepared. The company is to be capitalized at $3,500,000. The directors are A. D. Beach of Watertown, W. H. Gillett of Charlotte, C. S. Barker, G. L. Brown and others.

Stafford Springs, Conn.—New interest is now being taken in the proposed electric road.

St. Louis, Mo.—The Elevated Railway Construction Company has recently been incorporated with $100,000 capital stock to build an electric railway in this city. J. L. LaPrelle and C. W. Sargent are interested.

Toledo, O.—All the right of way for the Toledo, Port Clinton & Lakeside Electric Railroad has been secured and franchises are now being obtained through the towns along the route.

Two Rivers, Wis.—At a recent meeting of the city council T. Higgins, of Neenah, applied for a franchise for an electric street car line.

Tyrone, Pa.—The village council has passed an ordinance granting a franchise for the use of certain streets to the Tyrone Electric Railway Company.

MANUFACTURING.

New York City.—The Sprague Electric Company reports an increasing business along all the lines of its manufactures. The Lundell fans have had a big sale, and the sales in the Interior Conduit department have exceeded all previous seasons. Among other orders received for motors and generators is one from the Cooke Locomotive & Machine Company of Paterson, N. J., for a standard 300 kilowatt split pole generator of the belted type. The company has just issued a revised edition of the bulletin describing the Greenfield flexible steel armored conductors. It contains additional illustrations and prices.

COMPANY MATTERS.

Ottawa, Ont.—The Ottawa Electric Company, the works of which were destroyed by fire a few months ago, have completed arrangements for its reconstruction on a large scale. When the new plant is fully installed more than two-thirds of the machinery, etc., will be of American make.

Portsmouth, N. H.—The Gibbs Electric Signal Company held a meeting recently, and after accepting the articles of incorporation of the company, proceeded to elect officers. The board of directors were elected as follows: Henry C. Anthony, A. Lincoln Hambly, Frank G. Sweeney, Harry T. Gibbs, and Stanton M. Foye. By-laws were adopted, and a meeting of the board of directors was held after the regular meeting, at which Henry C. Anthony was elected president of the company, A. Lincoln Hambly, secretary and treasurer, and Harry T. Gibbs, general manager.

Springfield, O.—The National Electro-Magnetic Telegraph Company, of which Dr. Niles is president, will be reorganized next month into a construction company.

POWER AND TRANSMISSION PLANTS.

Oroville, Cal.—The Yuba Power Company has incorporated under the name of the Bay Counties Power Company, and new and powerful machinery is being put in. It is estimated that this company will generate 50,000 horse-power, which is to be sent to Napa City and to other places near the coast.

Walla Walla, Wash.—At a recent meeting of the city council T. J. Kirk, of Athena, and his associates requested permission to erect poles, wires and conductors for the purpose of transmitting electricity for light and power in this city.

MINES.

Rossland, B. C.—The new management of the Hall mines is considering the use of electric power instead of steam power, as heretofore, for its plant and machinery at the mine, and possibly at the smelter. L. A. Campbell is interested in the project.

AUTOMOBILES.

Detroit, Mich.—Articles of association were recently filed with the county clerk by the Automobile Rapid Delivery Company of this city with a capital stock of $25,000. The officers of the new company are John W. Goodson president, and Hamilton O. Davis general manager.

New Orleans, La.—Mr. E. W. Tucker is at the head of an automobile system, which is to be established here, much after the fashion of those now plying in New York and some other Northern cities.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Aug 21.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000,000	1¼ % Q.,	123	124
Allentown Pa.—Aug 21						
Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn.—Aug 21:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Aug 21						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.—Aug 21						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co. ...com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co. ...pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co. ...com.	50	10,000,000	9,085,000	3½ % S., Oct., '99	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	144½	145
Brooklyn N. Y.—Aug 21:						
Brooklyn City Ry.	100	2,000,000	1,928,400	....	231	233
Brooklyn Rap. Transit Co., tr certf.	100	43,000,000	48,000,000	....	56½	56⅜
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
*d Brooklyn City RR. ...guar	100	12,000,000	12,000,000	3¼ % Q., Jan.,	287	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	2½ % Nov., 99	322	825
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co.	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ...pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Aug 21						
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co.	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.—Aug 21						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Aug 21						
Charleston City Ry. Co.	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co.	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Aug 21						
Chicago City Ry. Co.	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	250	255
Chicago & South Side R. T. RR.	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	Feb 28 1900.	30	31
Met. West Side El., pfd	100	15,000,000	9,000,000	....	79	80
North Chicago Street RR.	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	90	200
South Chicago City Railway	100	2,000,000	1,603,200	....	96	99
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry. ...com	....	1,250,000	624,900	35 %	11½	12½
Union Traction Co. ...pref	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.—Aug 21:						
Cincinnati Inc. Plane Ry. ...com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry. ...pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	26½	127
Cleveland, Ohio.—Aug 21						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¼ % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry.	100	12,000,000	12,000,000	¼ % Q., Oct., '99.	87	88
Detroit, Mich.—Aug 21						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry.	100	....	1,200,000	....	175	..
Rapid Railway Co.	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.	100	250,000	200,000	....	100	110
Dayton O.—Aug 21						
City Railway Co. ...com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co. ...pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	..	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref stock of U. R & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Aug 21:						
Hartford Street Ry. Co.	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,00	247,00	....	--	--
Holyoke Mass.—Aug 21.						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—Aug 21.						
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind.—Aug 21.						
*†Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Aug 21						
Pennsylvania Traction Co.	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry.	....	....	87,500	....	--	--
West End Street Railway	...	....	....	....	--	--
Louisville, Ky.—Aug 21:						
Louisville Ry. ...com.	100	4,000,000	8,500,000	1¼ %, April.	78	79
Louisville Ry. ...pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Aug 21						
Twin City Rapid Transit ...com.	100	17,000,000	15,010,000	....	68⅜	68½
Twin City Rapid Transit...7 % pfd.	...	8,000,000	1,712,200	1¾ %, Oct.	186	187
Montreal, Canada.—Aug 21						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S., M. & N.	249	250
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—Aug 21:						
Memphis Street Railway Co.	100	500,000	500,000	....	2	--
New Haven, Conn.—Aug 21:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	--
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.—Aug 21						
Canal & Claiborne RR. Co.	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
a Crescent City RR. ...guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR. ...guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %, June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Aug 21:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	355	800
c Christopher & 10th Sts. RR. ...guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q. Nov.	120	85
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2½ % Q. Feb., 1900.	154¼	151⅝
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave. ...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	392	400
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR. ...guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR. ...guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co. ...guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	197	202
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¾
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Aug 21:						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	....	57¼	59
North Jersey Railway Co.	100	6,000,000	6,000,000	....	23	24
United Elec. Co. of New Jersey	100	504,000	504,000	11¾ % A.	18½	19½
Pittsburg, Pa.—Aug 21:						
Allegheny Traction Co.	50	500,000	500,000	....	55	56
o Consolidated Traction Co. ...com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co. ...pfd.	50	9,473,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co.	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co.	50	8,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co.	50	8,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry.	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co.	50	8,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry.	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	†3,000,000	8,000,000	5 % A., June	..	..
United Traction Co. ...com.	50	17,000,000	17,000 000	J. & J.	14	14¼
United Traction Co. ...pref.	50	8,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'b Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass - Aug 21						
Union Street Railway Co.	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass - Aug 21						
Northampton Street Ry.	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb. - Aug 21						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J. - Aug 21						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I. - Aug 21 :						
United Traction & Electric Co	100	8,000,000	8,000,000	½ %, Oct. '98.	109	111
Philadelphia. - Aug 21						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	28	24
Hestonville, Man. & Fairmount....	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡538,900	3 % S—July, '99	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co........ $12½ pd	50	30,000,000	29,980,450	....	86⅞	87
*b*Electric Traction Co........	50	....	8,297,920	....		...
*d*Citizens' Passenger Ry........	50	500,000	†192,500	$8 share Q.	345	..
*c*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.'99	450	451
*f*Lehigh Avenue Ry. Co........	50	1,000,000	....	....	43	...
*f*Lombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry..	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*e*People's Traction Co........	50	10,000,000	†6,000,000	3 %, A., April, '98.	.	..
*g*Germantown Passenger Ry....	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....		...
*i*Philadelphia Traction Co........	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¼	98½
*j*Catherine & Bainbridge St......	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar..	50	1,000,000	‖580,000	$6 share—July, '98	158	157
Empire Passenger Ry. Co......	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry......	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	.
*j*Ridge Avenue Passenger Ry....	50	750,000	‖420,000	$12 share, July '98	308¾	809
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar..	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co........	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry ..	50	750,000	‖750,000	$10 share, July '98	262	253
Rochester, N. Y. - Aug 21						
Rochester Railway Co........	100	5,000,000	5,000,000	....	15	17
Reading, Pa. - Aug 21						
j Reading Traction Co........	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry........	50	850,000	850,000	Jan., '98.	188	...
*l*East Reading Electric Ry........	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo. - Aug 21:						
Fourth Street & Arsenal Ry........	50	800,000	150,000	....	--	..
Jefferson Avenue Ry. Co........	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry........	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co........	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds....	..	2,500,000	2,500,000	....	..	..
Citizens' RR........	100	2,000,000	1,500,000	1 %, Oct., '98.	..	..
St. Louis RR........	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR........	50	2,400,000	2,300,000	1½ % Jan., '99.	..	--
People's RR. Co........	50	1,000,000	300,000	50c., Dec., '89.	..	..
United Electric Ry........com	50	500,000	500,000	....	20	21
United Electric Ry........6 % pref	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry........	100	2,500,000	2,500,000	....	68	70
Union Depot RR........	100	4,000,000	4,000,000	3 % A., July, '99	..	..
San Francisco, Cal. - Aug.						
California St. Cable RR........	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR......	100	1,000,000	875,000	$2.50 share, '96.	60	..
Market Street Ry........	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR........	100	1,000,000	550,000	....	..	16
Scranton Pa - Aug 21						
Scranton Railway Co........	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	..	..
Springfield Ill. - Aug 21						
Springfield Consolidated Ry	100	750,000	750,000	....	--	..
Springfield O. - Aug 21						
Springfield Street Ry........	100	1,000,000	1,000,000	....	..	11
Springfield, Mass. - Aug 21						
Springfield Street Ry........	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada. - Aug 21:						
Toronto Street Ry........	100	6,000,000	6,000,000	1¾ % S. ‡	97½	97⅝
Montreal Street Railway Co........	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C. - Aug 21:						
Belt Ry. Co........	50	500,000	500,000	....	..	..
Capital Traction Co........	100	‡12,000,000	12,000,000	65c. per sh, Oct. '99.	102⅞	102⅞
Columbia Ry. Co........	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.....	50	200,000	200,000	....	20	21
Metropolitan RR. Co........	50	1,000,000	453,900	2½ % Q.	..	..
Worcester, Mass. - Aug 21						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	80	81½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1899	...	85
Wilkesbarre, Pa. - Aug 21						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1 %, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass. - Aug 21						
American Bell Tel Co........	100	50,000,000	28,650,000	4½ % Q., Jan.	295	302
Erie Telegraph & Telephone Co....	100	......	.. ..	1 % Q., Feb 20,	96	97
New England Telephone Co........	..	10,894,600	10,804,600	$1.50 p. sh. Feb	123½	125
New York. - Aug 21						
American Telegraph & Cable Co..	100	14,000,000	14,000,000	1¼ % Q	91	94
Central & South Am. Teleg. Co. ..	100	6,500,000	6,500,000	1½ % Q.	102	106
Commercial Cable Co........	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	115	117
International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	.....		2	2¼
New York & New Jersey Tel. Co..	100	5,000,000	3,723,000	2½ % Q., Jan.,	160	168
Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	.....	2 % S.	50	75
Postal Telegraph Cable Co........	100	15,000,000	15,000,000	1 % Q.	..	.
Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
Commercial Union Telegraph Co...	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co........	..	......	97,870,000	1¼ %, Q, Jan. '99.	80⅞	80¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous. - Aug 21 :						
American Dist. Teleg. (Phila.).....	25	400,000	.....	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co..	100	......	.....	....	60	70
Chicago Telephone Co........	100	......	.....	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	..	....	75	76
Hudson River Telephone Co.......	100	2,000,000	2,000,000	1 % Q.	119	120½
Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co.......	50	.... .	.....	.	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	....	.		..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass. - Aug 21:						
Fort Wayne Electric trust receipts	..	.....	.....	..	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	.....	....	.	35	48
General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q., Aug 1898		
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	39	140
T.-H. Elec. Co..T. Secur., Series C	..	.....	.....		22	23
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	..	44	46
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York. - Aug 21						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	..	119	120
Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.		..
Edison Ore Milling Co........	100	.....	......	...	8	12
Electric Vehicle Co........com.	..	......	......	..	..	..
General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug. 1898		..
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q. Apr., 1900.	159	140
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000		41	.
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa - Aug 21						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co........	50	800,000	800,000	Q	--	--
Philadelphia, Pa. - Aug 21						
Edison Electric Light Co........	100	2,000,000	......	......	144	144½
Electric Storage Battery Co..com.	100	8,500,000	......	......	75	74
Electric Storage Battery Co...pfd.	100	5,000,000	. ...	......	77	80
Northern Elec. Light & Power Co..	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous. - Aug 21						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co........	25	.....	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	150	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.......	100	......	......	....	118¾	120
Royal Elec. Co. (Montreal)........	..	1,000,000	.....	2% Q ‡	201	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1¾ % Q	181	182½
Thomson-Houston Welding Co.......	100	......	......	3 % S, Dec. 1, '96.	..	100
Woonsocket (R. I.) Electric Co.....	100	. ....	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass. - Aug 21:						
American Electric Heating Co........	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York. - Aug 21 :						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa. - Aug 21						
Electro Pneumatic Trans. Co.......	10	1,500,000	......	---	2¼	2⅜
United Gas Improvement Co..scrip.	50	10,000,000	......	---	..	162
Welsbach Commercial Co.....com.	100	8,500,000	......	---	21½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co........	5	525,100	......	....	48	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa. - Aug 21						
Carborundum Mfg. Co........	100	200,000	200,000	....	--	
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	190	192
Miscellaneous. - Aug 21						
Barney & Smith Car Co........com.	100	......	1,000,000	---	18	16
Barney & Smith Car Co ....pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co........	25	......	....	....	32	..
Consol. Car Heating Co........	100	1,250,000	1,250,000	1½ % Feb	57	59
Johns-Pratt Co........	100	....	....	---	105	109
Pratt & Whitney Co........com.	100	......	....	---	2	4
Pratt & Whitney Co........pfd	100	....	......	---	40	50
Stilwell-Bierce Co........com.	--	....	....	---	--	50
Stilwell-Bierce Co........pfd.	--	....	....	2 % Sept 1, '99.	70	65
Schultz Belting Co........	100	500,000	....	....	80	90
St. Charles Car Co........		-------	-------	-----	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s	$500,000	427,500	1940	J. & J.	*118½	119⅛
‡The Albany Ry. Co..... Gen. mtg. 5s	750,000	375,000	1947	M. & N.	*117	......
‖Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co...................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co
‖Principal and interest guar by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co..... 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 6s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Aug 21, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	5,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Aug 21, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....
†Charleston City Ry.......... 1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1908	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T............. 4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.... Con. mtg. g. 5s	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 ds. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co

Cincinnati, O.

Date of Quotation—Aug 21, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked a.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry...............1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	.....
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.. cons mtg. 6s	$150,000	$150,000	1912	M. & N	......	....
Crescent City RR.............1st mtg 6s	......	50,000	1899	M. & N	105½	......
Crescent City RR.......Cons mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	800,000	75,000	1906	J. & D	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	101	105½
Broadway & 7th Ave.........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000 000	5,181,000	1945	....	109½	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	99½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	82	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry ....Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
‡‡Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Aug 21, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.....................1st mtg. 5s	2,500,000	800,000	1908	M. & S.		....
†Toronto St. Ry............1st mtg. g. 4½s	4,550,000	2,200,000	1921	M & S.		....

†$35,000 per m. single track authorized $600,000 in escrow to retire 6s due in 1901

Philadelphia.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry...........1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry......................1st mtg. 7s	800,000	200,000	1900	J. & J.	...	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	...	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	...	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	...	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	367,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	....
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	....	....
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	...	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	...	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Aug 21, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Aug 21, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J & J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—Aug 21, 1900						
Jefferson Avenue Ry..........1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.....................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
¶People's RR. Co.....................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co...............Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99⅛	100⅛
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100⅛
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J. .	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126⅛	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126⅛	.....
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105⅛	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry..........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*—Aug 21, 1900						
Belt Ry. Co..........................U - mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry...........................' mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 21, 1900.						
Bridgeport Traction Co.........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	*2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅞
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119⅛
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N. J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry.............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105⅛	106
St. Paul City Ry.........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$37,000 in treasury.
§$980,000 res'ved to redeem prior liens.
††$520,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Aug 21 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	103
Edison Elec. Illuminating Co., Boston...	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—Aug 21, 1900						
Allegheny County Light Co........ ....6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Aug 21 1900)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	... .
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s	8 000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	. ...	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 21, 1900.					100½	101
American Bell Telephone.................. 4s.			1908	F. & A.	......	....
Northwestern Telegraph Co...............7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Aug 21, 1900						
American Electric Heating ....7s.	500,000	500 000	....	....	....	......
Armington & Sims Engine Co..............	....	....	. .		......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.		....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

Unlisted ‧Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

The Chicago Union Traction Company has substituted coal for oil in its firerooms.

It is thought that the Philadelphia Electric Company will retire $2,000,000 of its 4 per cent. bonds.

The annual meeting of stockholders of the American Railways Company will be held September 20.

The books close for the annual meeting of the Southern Light & Traction Company on September 11 and reopen October 2.

The Brooklyn Elevated Railway was sold at auction under foreclosure on August 15 for $174 837 to the Brooklyn Union Elevated Railroad Company.

The net earnings of the Pittsburg & Birmingham Traction Company for the fiscal year increased 53.75 per cent. There was practically no increase in operating expenses.

The members of the New York Stock Exchange Monday voted favorably on the petition circulated last week for the closing of the Exchange on the Saturday preceding Labor Day.

The United Traction Company of Albany, N. Y., has obtained a writ of certiorari against the State Board of Tax Commissioners in an effort to reduce its assessment by more than half.

The Kings County Electric Light and Power Company has declared the regular quarterly dividend of 1½ per cent., payable September 1. Books close August 22 and reopen September 1.

A deal has been closed for the consolidation of the street railway and electric plants in Dubuque, Ia., under a new company, which has a capital of $1,000,000 and a fifty-year charter.

The Elmira Water, Light and Railroad Company reports as follows: (Railroad department): Gross earnings, $20,824; increase, $10,665; net income, $3,571, increase, $3,781; profit and loss deficiency, $13 216.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 13@16; New York Electric Vehicle Transportation, 8@8½; New England Transportation, 3@3½; Gramophone, 35@40.

The report of the Westchester Electric Railway shows: Gross earnings, $13,746; increase, $4 121; operating expenses $12 592; increase $5,904; net earnings, $1,154; decrease, $1,783; fixed charges, $8,194; increase, $975; deficit, $7,039; increase, $2,757.

At the annual meeting of the stockholders of the Calumet and Hecla Mining Company on the 15th inst., the retiring board of directors was re-elected. A resolution was also passed, providing for the extension of the charter and corporate life of the company 30 years, the present charter expiring by limitation April 13, 1901.

The meeting of stockholders of the Pratt and Whitney Company to act upon the proposed "deal" with the Niles-Bement Pond Company was adjourned until September 20. There is apparently no opposition of importance, but it seems difficult work to get at the stockholders. At the last meeting it was found that 22,278 shares, out of a total capitalization of 27,500 shares, was pledged in favor of the combination.

The Montville Street Railway Company, which connects the cities of New London and Norwich (Connecticut), makes the following statement of earnings, from which it appears that the interest charge for the entire year has practically been earned in 10 weeks. from June 5, the opening of the road, to August 12, 1900: Gross receipts, June 5 to August 12, 1900, $19,500; operating expenses (estimated), $7,500; net receipts (estimated), $12,000; one year's interest on its $250,000 5 per cent. bonds, $12 500.

The two most important events in Wall Street the beginning of this week were the death on Monday of John D. Flower and the advance of nearly five points in General Electric. There was a little flurry in stocks when the announcement of Mr. Flower's death was made, not because of any general liquidation, but because the ever restless professional traders were seeking some excuse for raiding the market. As regards the advance in General Electric, the old story of a probable consolidation of the company with the Westinghouse Company was revived, but there seems to be no more foundation for the report now than at any time in the past.

The officials of the American Telephone Company are not as yet prepared to state publicly the amount of deposits of American Bell Telephone stock for exchange into that of the American Telephone and Telegraph Company. A prominent banking house of Boston, however, which is indentified with telephone interests, in a recent private letter to its customers places the amount of American Telephone stock now outstanding at about $90,000,000; the authorized issue is $100,000,000. The market value of the collateral underlying the 4 per cent. bonds of the American Telephone Company is declared to be 33 per cent. in excess of the par value of the bonds issued.

A so-called "preliminary report" for the year ending June 30, was issued by the Brooklyn Rapid Transit Company on August 17. It gives the receipts from all sources as $11,768,550, or $152,517 more than they were in the previous year. The expenses were $11,241,778, or $276 136 less than in the previous year. The net result of the year's operations, therefore, was a surplus of $526 772, or an increase of $728,653, the previous year having shown a deficit of $201,881. The report adds $96,654, designated a "surplus June 30, 1899," to the excess of receipts over expenditures, namely, $526 772, making a total surplus on June 30, 1900, of $623 426. The capital stock is $45,000,000.

All of the reports of earnings which come to hand either of the Third Avenue Railroad proper or its various subsidiary lines demonstrate the beneficial effect of the management which has been installed by the Metropolitan Street Railway. The quarterly report of the Dry Dock, East Broadway and Battery Road shows surplus earnings above all charges and expenses. This property had previously been a drain upon the Third Avenue. The Union Railway, otherwise known as the "Huckleberry Road," also reported a very favorable statement for the quarter ending June 30. According to the figures presented there was an increase in gross income of $37 737 and the insignificant increase in operating expenses of $5,244. Even though charges were $11 348 larger than during the same period last year the balance remaining was $67,466, an increase of $38 145.

A gentleman closely affiliated with the Union Traction Company of Philadelphia, and a large holder of the stock, said on Saturday: "A surplus over fixed charges of $938,000 for the year June 30, 1900, is a handsome gain as compared with $625,000 for 1899 and $25,000 for 1898. Some of the would-be critics have affected to look askance at the large surplus reported in these succeeding years, but it should be noted that now practically every dollar increase in net earnings means a dollar more for surplus, since fixed charges remain the same, and the company is now more than earning them. What I want to point out is that to produce the surplus several times the amount of the preceding year but a relatively small percentage of increase in net earnings was necessary. The company has gotten down to as low a level of operating expenses as it can safely go, and the bigger earnings for the stock are being made by healthy increase in gross receipts."

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ELECTRICITY.

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EDITORIAL NOTES.

Official Action Against the Third-Rail.

We are pleased to note that the editorial which appeared in the issue of Electricity of August 15 on the "Third-Rail" has to a great extent been the means of causing the authorities to take some action that would tend to reduce the number of accidents through it in Brooklyn to a minimum. In the editorial referred to it was pointed out that the third-rail system of train propulsion was an excellent one under certain circumstances and one that could not well be gotten along without, but we deplored that more precautions were not taken to prevent accidents through it. We suggested that the third-rail roads in this vicinity be made to adopt the precaution taken by the Baltimore & Ohio Railroad Company on its new third-rail system through the Belt Line tunnel, by encasing the third-rail between two planks set on edge. Our suggestion would seem to have fallen on fertile ground, for Deputy Commissioner James J. Kirwin, of the Department of Public Buildings, Lighting and Supplies, on August 22 issued an order to the railroad companies that they must either make the system absolutely safe or do away with it entirely.

Mr. Kirwin said that he had determined that all danger in the use of the third rail system in Brooklyn should be done away with, no matter what the cost was to the operating companies, or he would institute measures to prevent the use of the contrivance in that borough. His department, he added, had been carefully watching the elevated roads with a view of requiring such additions and alterations as experience proved to be necessary for the safest possible operation of the system. His inquiries on the subject, the Deputy Commissioner declared, had disclosed the fact that a third-rail system, almost identical with that upon the Brooklyn elevated structures, had been maintained upon the New York and Brooklyn Bridge for several years, and he had been reliably informed that it had been generally successful as to both reliability and freedom from accidents.

Mr. Kirwin's department is investigating at least half a dozen suggested methods of "killing" the third-rail system most promptly in case of emergency. He feels confident that the solution is in sight. One proposition was to place the rail in the middle of the track instead of upon the side, and to protect it with upright boards on either side projecting slightly above it. This plan may eventually be given a practical trial. It is understood that Commissioner Kearney has recently directed Bridge Commissioner Shea to either discontinue the use of the third-rail system on the Brooklyn Bridge or to remedy it by placing guards three inches high on either side of it so, as to prevent ready access and contact with it. In connection with this matter it might be mentioned that systems similar to that employed on the Brooklyn elevated structures are now in use on the elevated roads in Chicago and Boston, and also on private rights of way at Atlantic City, Nantasket Beach, Hartford and elsewhere.

The Manhattan Railway Company, it is understood, is preparing to install its third-rail system in a way that will make it absolutely safe. How it proposes to do this has not been made public. We do not see any reason why the third-rail system should be abolished entirely, providing ordinary precautions are taken in shielding the third-rail.

* * *

Again the Brooklyn Bridge and Electrolysis.

At frequent intervals a hue and cry is raised in the daily papers regarding the possible effect of electrolytic corrosion on the anchorages of the Brooklyn Bridge. This state of affairs has been going on ever since Mr. A. A. Knudson discovered some years ago, in making an electrical survey of the Borough of Manhattan, that certain portions of the metal work at the bridge entrance on the New York side were positive to earth.

This periodical electrolysis scare, as it might be termed, has again been resurrected by a number of voltmeter readings recently made, in which it was found that the cables of the bridge were on an average .88 volt positive to earth. With this figure as a basis, the journal which has taken up this matter, argues that as .00238 pound of metal is dissolved per ampere hour; with the amount of current flowing through the structure 52 lbs. of metal are lost by electrolytic corrosion every twenty-four hours, or, in other words, slightly less than 9¼ tons a year. The anchor plates of the bridge are said to weigh in all about 184 tons, which would apparently mean that the bridge would be left entirely without support in a trifle less than twenty years.

Mr. A. A. Knudson, who is recognized as one

of the leading authorities in the country on the destructive action of stray electric currents, referring to this subject says:

"From my knowledge of how stray currents, even of the smallest power, eat and pit the water pipes of cities, I am certain that the stray currents on the bridge must be eating away the structure somewhere. I should say that the trouble was taking place at the anchorages or among the links where the cables are jointed to the anchor plates, if there is moisture there sufficient to carry current. From what we know of underground conduit work it would seem probable there is moisture present. The conclusions arrived at, therefore, are not only possible but very probable."

Another authority, after stating that the anchor plates are imbedded in cement, goes on to say:

"If any one should ask you about that it might be well for you to know that the telephone companies are constantly getting 'grounds' in their wires laid in cement conduits, because of the moisture soaking through the cement. Cement, therefore, is not an insulator and the bridge anchors are not as high and dry as many persons suppose. I might point out another danger. When iron is cast, the heat of it causes the silica in the sand to fuse over its surface a veritable coating of glass. Now this must have been the case with the Brooklyn Bridge anchors, which would then be covered with a glasslike shield, sufficient, you might think to insulate them from corroding currents. But here is a real danger. The glass forms an irregular covering, leaving spots of bare iron exposed. Here is where the electrolytic effects would take place, the current eating holes in certain parts of the anchor plates instead of destroying them evenly all over, and, if I may suggest, very likely shortening that twenty year limit."

We do not agree in every particular with the views of the gentleman just quoted, nor do we think the Brooklyn Bridge would be likely to fall in twenty years, for in order to destroy 9½ tons of metal a year by electrolytic action all the conditions would have to be most favorable. Nevertheless, as the exact progress made by electrolytic action cannot be very well ascertained, owing to the inaccessibility of the anchorages, it behooves the authorities to take some action, and that speedily, to divert any stray current from the cables. This could be done without an enormous expenditure of money, and would set at rest once and for all the periodical cry of "Is electrolysis destroying the Brooklyn Bridge?"

* * *

Scotch Water Power Schemes.

California, as regards the utilization of water power for generating electricity, may justly be termed the Switzerland of America, and it will not be the fault of certain well-known English electrical engineers if Scotland is not ultimately made the Switzerland of Great Britain in this respect. As will be recalled, Lord Kelvin suggested some years ago that the waters from the many lochs in Scotland be made to turn turbines for generating electric current, which could be utilized to advantage for manufacturing purposes in localities where coal was difficult to obtain. Unfortunately, Lord Kelvin's practical views did not meet with the approval of a certain conservative element of land owners, who were wont to spend a limited portion of the year in the mountains of Scotland hunting and shooting. Thus the scheme hung fire, retarded or indefinitely postponed, through the efforts of lovers of the æsthetic.

The promoter's idea was evidently to bring about in Scotland, what has so successfully been brought about in California, by the harnessing of mountain streams. Before the advent of long distance electrical transmission, California, owing to the high price of coal, was unable to support a manufacturing industry of any description, those having the temerity to start up such enterprises invariably failing, owing to the impossibility of successfully competing with products manufactured in the East.

The starting up of such water power plants as that of San Gabriel, San Joaquin and others changed all this and enabled electrically operated factories to be opened, which were more than able to hold their own with competitors outside the State.

Apparently the conditions in Scotland are somewhat similar to those that existed in California, only on a less marked scale, and it is with the idea of placing cheap power within the reach of all that the promoters of the Scotch scheme are still persevering. Referring to this subject our London correspondent says that fancied objections as to the spoiling of natural beauties, and opposition on account of anticipated injury to fishery interests, have temporarily prevailed. This opposition, however, does not discourage the promoter for long together. Encouraged by the sanctioning, though in modified form, of the several electric power schemes, certain leading electrical engineers are just now to the fore front with a project for establishing generating stations for the supply of electrical energy throughout the west of Scotland. A second project is for the supply of electrical energy throughout the industrial districts around Glasgow.

The above is an illustration of how pleasure frequently retards progress.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A special staff has gone out from Berlin with Count von Waldersee to establish wireless telegraphy in China.

It is understood that Mr. Bostwick will enter his French automobile in the races at Newport, R. I., on September 6, and that he and Willie K. Vanderbilt, jr., will struggle hard for the automobile championship of the United States.

A trust in electricity to control every plant and system in Wisconsin is said to have been planned by Milwaukee capitalists. This company, the articles of which were filed with the register of deeds on the 24th inst., can purchase or get control of everything with which electricity has a connection.

Improved machinery is expected to displace several hundred men in the National Tube Works at McKeesport, Pa., within the next two months. The new machine is for welding couplings, and will revolutionize the making of couplings in every tube works in the control of the National Tube Company. About 300 men are employed welding couplings in the National Tube Works. The new coupling machine is fed by a laborer. One machine will do the work of half a dozen coupling welders. Into it is fed the iron or steel material at one end and it turns out the finished coupling at the other. The machine is operated by electricity, and the welding is done by the same power.

The experiment of using an electric locomotive to replace the ordinary steam one in railroad traffic is to be tried in Michigan. The Grand Rapids & Indiana Railroad has secured a heavy electric motor from the East and will use it to pull the trains on its line between Petoskey and Harbor Springs. Railroad men will await the result of the experiment with considerable interest.

A dispatch from Montreal says the electric car service from Quebec to the Shrine of Ste. Anne de Beaupré has been successfully inaugurated. The cars run at a rate of twelve miles an hour, and there will now be forty-six trains a day.

Electric fans are being introduced in England and are meeting with great favor. In a report to the State Department on the subject United States Consul Halstead at Birmingham says: "The heat wave in London has created an opening for electric fans. Although 'suction' ventilating fans, driven by electricity, are quite well known, I have never seen an electric fan of the cooling type in use in England. I wonder why our manufacturers in this line neglect their opportunity here."

The Old Time Telegraphers' Association will hold its twentieth annual reunion in Minneapolis, Sept. 18, 19 and 20. The reunion will be attended by about 600 telegraphers who were in the business over twenty years ago. The reunion will bring some very prominent people to the Twin Cities. There will be such men as Thomas A. Edison, Andrew Carnegie and Cushman K. Davis. Harry C. Hope. superintendent of the telegraph department of the Omaha Road, is president, and H. A. Tuttle, of the North American Telegraph Company, vice-president.

It is stated in the Portuguese press that Dr. Variot, of Paris, has discovered a process for embalming bodies which he hopes will prove a great success. He not only embalms, but metallizes the bodies by electroplating them. In this manner they can be preserved indefinitely and in such perfection that the most imperceptible wrinkles and lines are reproduced, and the embalmed body has the appearance of a metal statue. In order to electroplate a body it is given a bath in pure carbolic acid, and being strongly rubbed with nitrate of silver, the body is submerged in a galvanic bath, after which a slight layer of nitrate is applied to it.

Master Mechanic W. R. Bullis, of the Chatham, N. Y., and Lebanon Valley Railroad has invented and run a tricycle automobile, the motive power of which is an electro gasoline motor. The machine has been given its first trial, and it operated successfully.

At the shops of the Southern Pacific Railway at Ogden, Utah, says the "Railway and Engineering Review," there was recently installed a 36 horse power Diesel motor, by means of which it is expected to supply power for the machine shop through the use of crude California petroleum. As the use of this type of motor in the West is novel, much interest is

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being excited by the trial, for the oil fields of California provide much reason for desiring its success. The Diesel motor is essentially a gasoline engine adapted to use crude petroleum or other oils direct. It operates on the 4-stroke or Otto cycle, but differs from other internal combustion motors in compressing a full charge of air to a point above the igniting point of the fuel, then injecting this fuel for a certain period into this red-hot air, where it burns with limits of pressure and temperature under perfect control. There are no explosions, but steady combustion at a predetermined much lower temperature and without essential increase in pressure, the combustion line being practically isothermal.

KALAMAZOO, MICH., has lately been suffering from the worst invasion of grasshoppers ever known in the vicinity. Houses and stores have swarmed with the insects and the people have been driven to their wits' ends to get rid of them. On account of the plague the city authorities were obliged to order the electric current cut off the arc lamps because the hoppers so filled the globes that not a ray of light could be seen and the iron poles became charged with the current.

THE Hendrick Manufacturing Company of Carbondale, Pa., has recently installed a 50 horse power electric motor, which will be used to test the new pumps being turned out by that company.

WE learn that a concession has been granted to the Compagnie des Tramways Mecaniques to construct five new lines from the suburbs of Paris into the city, says the London "Electrical Engineer." The tramways are to be operated by three-phase current at high tension. The general application of electric traction on the Paris tramways should greatly develop the traffic, and is expected to extensively reduce the cost of running.

CONSUL-GENERAL GUENTHER writes from Frankfort as follows: "Steam power is to be superseded by electricity to a very considerable extent in the Government dock yard at Kiel, Germany. After experimenting with electric power transmission on a comparatively small scale, the administration has now decided upon a bolder scheme, whereby all the machine tools, etc., installed in the different workshops are to be electrically driven. To this end a power plant, having a capacity of 3,500 horsepower, is to be erected. This plant will also supply electrical energy for driving the powerful dock yard pumps."

THREE lines of electric omnibuses, intended to compete with the street cars for patronage in all parts of Chicago, are projected. The first electric vehicles will probably be in operation by October. They will be doubled decked, and will have seating capacity for forty passengers. They will take on passengers at any corner along the route until the seats are all filled, and then the vehicles will become expresses and will make no more stops until the downtown district is reached.

TELEGRAPH operators physically fit to pass examination for admission into the United States Army, and who are capable of sending and receiving well enough to handle an ordinary commercial wire, will be received into the service for duty in the Signal Corps. The army is in need of skilled operators, but the physical examination is thorough and it will be a waste of time for men with defective eyesight, under size or pronounced bodily defects to apply. The Government will require a considerable number of telegraph operators to equip the system in Porto Rico, the Philippines and Alaska, as the Signal Corps is likely to have charge of the lines in those countries for a considerable time.

TO DEMONSTRATE the advantages of the motor carriage the storage battery automobile is now being run daily on the streets of Providence, R. I., for the purpose of showing what may be expected of it. The advantages of this form of vehicle are freedom from odors and vapors and ease of operation. Its disadvantage is limited mileage: it is not suitable for long runs across the country; it was designed for service in the city and suburbs, and those who have no occasion to ride more than 30 miles doubtless will find it highly satisfactory.

ONE of the latest improvements in trolley apparatus introduced by the Helios Company of Cologne, Germany, is an ingenious device for lubricating the trolley wire of an overhead system of conductors. It is sufficiently obvious that an effective lubrication of this sort would greatly lessen the wear both of the wire and of the bow or roller collector employed, hence the device in question may find extensive adoption. But that, of course, depends upon the efficiency of the new apparatus, since many unsuccessful attempts have already been made to attain the same end. The latest attempt certainly gives great promise of success, for the apparatus evolved after careful experiment, is said to enable a thin and uniform coating of the lubricant to be spread along the wire. It is of light construction, being of aluminum, and may be carried by the collector arm or independently.

IN a paper recently read before the Physical Society of Frankfort-on-the-Main, Herr Schafer describes a "coherer" designed for use in connection with wireless telegraphy. The coherer is made by pasting strips of tinfoil on a glass plate. If the glass be silvered, it will answer the purpose equally well provided the silvering be divided into strips by a knife. A current of electricity across the metallic strips gave an electric resistance of 50, but when the electric waves impinged on them the resistance was increased a hundredfold. The coherer works in a vacuum.

THE scheme of the Merchants' Exchange to have loaded freight cars conveyed over the street car lines of Buffalo, N. Y., by electricity, to save the time and expense of cartage, is the cause of much comment throughout that city. Prominent wholesale firms strongly favor the adoption of the system, and will assist the Merchants' Exchange in the effort to bring it about.

THE new electric elevator in the tower of the City Hall in Philadelphia will be thrown open to the public about the middle of September or later. This elevator is of the Sprague electric pattern, and upon a pinch fifteen people can be carried in the car. Workmen have taken the slack out of the cables that support the car. These cables stretch considerably when new, and great precaution is required to get the right tension to the wire ropes. The height of the shaft from the seventh floor is about 370 feet. An iron stairway winds about the shaft for the use of sightseers who desire to stop off at intermediate floors, and view the city from the different heights. This shaft is now being enclosed by wooden slats in lieu of wire screens, which are intended to be put in place as soon as councils appropriate the money. The total cost of the shaft, car and machinery is approximated at $25,000.

HOW the busy bee improves the shining hour is quite evident in Denver, Col., as a swarm of the little honey gatherers has taken possession of one of the electric meters belonging to the Gas and Electric Company, much to the annoyance of the latter, saying nothing about the inconvenience they caused the agents who attempted to take the reading of the meter.

The Sixteenth Annual Meeting of the Association of Edison Illuminating Companies.

The following is the programme of the sixteenth annual meeting (twenty-first convention) of the Association of Edison Illuminating Companies, to be held at Grand Union Hotel, Saratoga Springs, N. Y., September 4, 5 and 6. It is expected that the following papers will be presented:

"Some Notes on Electric Elevators," Arthur Williams, New York.

"Systems and Apparatus for Light and Power Distribution," C. P. Steinmetz, Schenectady, N. Y.

"Polyphase Distribution," G. Semenza, Milan.

"Electric Elevators and Electric Hoists," John F. Gilchrist, Chicago.

"The Electrical Features of the Paris Exposition," W. C. L. Eglin, Philadelphia, Pa.

"The Year's Improvements in Meters and Measuring," C. D. Haskins, Schenectady, N.Y.

"Residence Rates in Detroit," Alex. Dow, Detroit, Mich.

"Arc Lighting Systems," Walter Fish, Lynn, Mass.

"Distribution from Transmission Circuits," D. L. Huntington, Spokane, Wash.

"The Past, Present and Future of the Incandescent Lamp," John W. Howell, Harrison, N. J.

"Efficiency of Electric Distributing Systems," F. Torchio, New York.

"Results in the Application of the Maximum Demand Rate System," C. S. Knight, Boston, Mass.

"Twenty-five Cycles vs. Sixty Cycles for Union Lighting Station," C. F. Stott, Buffalo, N. Y.

On Friday, September 7, by invitation of the General Electric Company, the delegates and guests will be taken by special train to Schenectady to visit the works of the General Electric Company.

COMING ELECTRICAL EVENTS.

American Electro Therapeutic Association—Will meet in New York City Sept. 25-27, 1900.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

Association of Edison Illuminating Companies—Will meet in Saratoga, N. Y., Sept. 4, 1900.

National Association of Municipal Electricians—Will meet in Pittsburg, Pa., Sept. 25-27, 1900.

Old-Time Telegraphers' Association and the U. S Military Telegraph Corps—Will meet in Minneapolis, Minn., Sept. 18, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

Street Railway Association of the State of New York—Will meet at Buffalo Sept. 18-19, 1900.

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DIRT MARKS AND ELECTRICAL CONDUCTORS.*

BY PROF. F. G. BAILY.

In connection with a recent article by Mr. Campbell Swinton (see ELECTRICITY May 16, 1900) on the subject of the accumulation of dirt by electrical conductors, I venture to bring forward some further remarks on the subject, as I have had the phenomenon under observation for some time on a large scale with varied conditions, and the results are therefore fuller and more conclusive. While agreeing fully with Mr. Campbell Swinton that the effect is due to electrostatic action, I may point out that he makes an error (though perhaps only a verbal one) in talking of positive and negative. The following observations show that the sign of the potential with regard to the earth is without or almost without influence on the result.

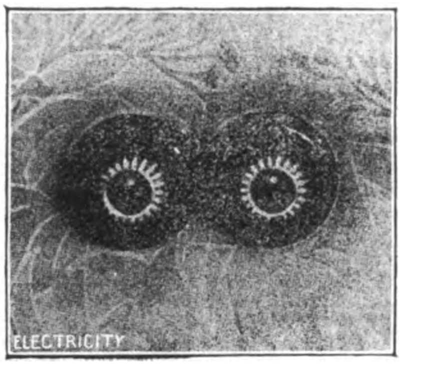
The system in Edinburgh is three-wire continuous current, with the middle wire earthed at the station and 230 volts on each side. Therefore the line wires are positive or negative to earth according as the circuit is connected to the positive and middle or negative and middle. An examination of several hundred lamps in various supports that have been erected for about 18 months showed that the deposit of dust round fittings or conductors was very small in all cases in which the switch was on the live side, though a certain amount of dirt had collected when the conductor passed very close to the ceiling or wall, as for example where flexible passed through eyes. When the switch was on the earthed side the deposit was always large and extended several inches from the conductor. Ceiling roses flexible, and the lamp holders were the most usual obvious cases, but even metal fittings produced the same effect if insulated from the wall. Two movable metal brackets mounted on wooden stands which hung from hooks on the wall showed the same dust marks round the base, and even a piece of string which hung from one of them had a line of dust opposite to it on the wall. These were both on the live side, and the effect is clearly due to leakage from the terminals of the lamp holder over the porcelain insulator to the metal part of the bracket, as there was no direct contact between them. The base of the bracket was of very well seasoned wood polished on all parts, and the room was a particularly dry one, so the conditions were favorable to the retention of electricity on the bracket.

No regular difference could be definitely observed in positive and negative circuits, but there was an indication that the deposit was more on the walls on the negative side, while on the positive side the fitting seemed more covered. This would indicate that the positive charge attracted the dust more than the negative charge, but the difference was not great.

Owing to the difference of potential between the live body and the earth there will be an electrostatic field between them, a charge of electricity positive or negative on the body, and a corresponding negative or positive charge on the earth in the immediate neighborhood. Any small light objects in the surrounding air will therefore be attracted to the charged surfaces. As Mr. Swinton points out, it can be almost completely stopped by putting the switches on the live side (not necessarily the *positive*, however), for when the lamps are burning the live and earthed conductors are very close together, and the earthed conductor forms the nearest earth for the opposite charge. When the conductors pass very close to the ceiling some of the charge is on the ceiling itself, and hence a small amount of deposit is formed there.

The rapid collection of dust on flexible, that is, on the live side is due to the fact that, when the switch is off, the whole of the flexible is charged with one charge, and the lines of force radiate into the air, drawing dust to the body from a large area, while with the switch on the live side, not only is the current on for a small portion of the day, but the two wires are oppositely charged and the lines of force are concentrated between the two, as in two parallel cylinders close together, and hence the area of dust-laden space that is acted upon by an appreciable field is very small. Dust does collect on these, but to a very much smaller extent.

The effect is extremely well shown with switches which are fixed to the wall without projecting back blocks of wood. Round all of these there is a very marked ring of dirt on the wall paper, with a thin line of clean paper close to the porcelain base, as shown in the accompanying photograph. There is evidently slow leakage from the live parts to the metal cover, which is highly insulated from earth by the porcelain base, and also slow creeping of the charge down the base, so that the whole



surface is electrified. The thin line of clean surface, which seems to be always present, is possibly caused by the field being very intense where the charges are so close together, causing the charged particles to be shot off again by electric repulsion. That the marks were not due to the housemaid's duster was clearly shown by the fact that electric bell pushes and gas brackets on the same walls showed no signs of dust marks. Where a switch is near to a side wall the mark appears at the place nearest to the cover, and where the switch is fixed on to narrow casing without any back block the dust appears under the projecting base. The effect is much less marked where polished wood blocks are used, since the dust does not stick to the polished surface and is blown off, or perhaps is repelled off again, and the wall beyond is almost out of reach. Glazed paper and varnished wood wainscoting are almost free from marks.

Since the switch must necessarily be alive, it is a matter of some practical importance, for switches are frequently placed straight on to the wall paper in drawing rooms and other carefully decorated places, and a wall paper is spoilt in a few months. The switch cover should therefore be earthed by being brought down outside the base, so as to enclose it completely. No electrostatic effect can then take place, for the charge will leak away to the wall as fast as it leaks over the insulation inside. It is true that this will lower the insulation of the system, since the insulation in most patterns of tumler switch between the handle and the live parts is somewhat thin. The following test on a small house of 34 lights shows this very clearly. Testing to earth with all wires connected and lamps in, the insulation came out at 50 megohms with a pressure of about 450 volts. The handles of 10 switches were connected by a wire to a good earth, and the insulation dropped to 15 megohms. With a different set of eight switches earthed it fell to 9 megohms, and with 21 switches earthed it fell to 5 megohms. None of the switches were faulty, and they were nearly new and two of the best patterns in the market. They form, however, an undoubtedly weak part in the installation, which is otherwise excellent.

Now that 230 volts is a common pressure I think there is a real need for improvement in the tumler switch; for with the earthed return, which is also becoming usual, a person with delicate hands who is sensitive to shocks may easily receive very unpleasant information that a switch is poorly insulated. The insulation afforded by the base is a bogus and illegitimate one, since it is outside of a part which is intended to be dead, and I trust that some manufacturer will supply a switch that will not give shocks nor make dust marks, one that has an earthed cover and sound ample insulation inside. If the dust question is not heeded, electric lighting will lose some or its claim to be the cleanest form of illuminant.

* From the "Electrician," London.

AUTOMOBILES IN MILITARY USE.

(From the New York Sun.)

The immense advantages presented by automobiles have had a great fascination for progressive military men, but there are great difficulties in the way of their practical application. Nevertheless, all the great nations of the world have studied this subject more or less thoroughly, in order to determine the field, the extent and the limitations of their application in military science and the art of war.

From the consensus of opinions the following brief summary indicates the uses to which automobiles may be put in war.

In the first place, they may be used for transporting rapidly strong detachments from one point to another, either in an advance to seize important points, or in the critical stage of a battle, to outflank the enemy or to pierce his line. There are many difficulties in the way, however, and the practical application in the field is a problem that has yet to be solved.

In France experiments have been carried on under a technical commission since October, 1897, and artillery officers are charged with the duty of following the course of the practical trials, with a view to determining what may find application in the military service.

During the manœuvres of 1898 the reservists were authorized to use automobiles, and the latter were thus subjected to test under the most varied circumstances. Gen. Jamont, for example, after the first battle, dismounted from his horse, entered his automobile and made the tour of the cantonments of his troops, visiting on the way his principal field depot of supply. He was thus able to make in a very short time a circuit of fifty miles and to see for himself, without fatigue, the exact position and condition of his command, a feat which would have been quite impossible with horses alone. The extent of modern battlefields has

rendered it necessary for the commanding general to rely largely on the reports of his subordinate commanders; but the automobile may enable him, as of old, to see for himself at least the most critical part of the field.

In Germany every effort is constantly made to apply in the army the results of all progress in industry, and automobiles have received their share of consideration. During the grand manœuvres of 1899 eight automobiles were placed at the disposition of the commander-in-chief, six of which were assigned to the different general staffs. All these vehicles were tested more particularly late in the evening and at night. On one occasion two of them were sent out in the night with a bundle of printed orders, maps, etc., with a view to having them distributed to the troops before morning. One of the carriages struck a large stone and was rendered useless. The officer in charge of the vehicles put the load of the injured carriage on the other and continued on his way, covering about sixty miles in so short a period that the papers were distributed in ample time.

In February of this year the German Emperor offered a prize of $20,000 for the best military automobile.

In the next place, automobiles are to be used in the transportation of supplies (food and forage) and ammunition, not only in the general train, but also in the regimental field trains; in the transportation of siege artillery material and of the material of and ammunition for mountain artillery, and, finally, in replacing the company wagons.

This has been the field most extensively investigated, and this will probably be the main application of the automobile in war.

In Italy, in consequence of trials made by the engineers of the army, the War Department decided as early as 1897 to assign to the army a certain number of automobiles for the transportation of baggage. This nation was particularly anxious to adopt a carriage which economized the horses needed, because of the scarcity of these animals in the country.

In Russia the Grand Duke Vladimir has been studying the possibility of transporting the artillery by means of automobiles, reserving the horses for the cannoneers and for special movements or to assist at difficult points on the road. In this way the number of horses needed could be considerably reduced, and their condition, on arriving on the battlefield, immensely improved.

In Austria the Daimler automobile has been introduced into the army for the transport of heavy artillery material and particularly for the transportation of ammunition for the guns of the Steinfeld polygon near Wiener-Neustadt. The motor is a 10 horse-power benzine motor, giving the wagon a speed of from three to seven miles an hour with a load of 11,000 pounds on a slope of one in ten. A number of trials has been made near Vienna as well as in the mountains of Galicia, and the results have passed all expectation.

France has experimented with automobiles for heavy loads with the Scotte wagon for supplying the forts on the right bank of the Seine and with the Dietrich wagon in the Soudan.

Germany, from an appropriation of $25,000, has recently purchased seven automobiles for the transportation of commissary stores and ammunition. During the manœuvres of 1898 on the Weser such an automobile was tested and in those of 1899 two automobiles were used on the relay lines of supply.

Belgium is having one of its army wagons for the transportation of supplies transformed into an automobile. The new wagon weighs 4,400 pounds and its maximum speed is ten miles an hour. The constructors are now trying an 18-horse-power motor with direct transmission, American rubber tire with interior steel wire cables being adopted for the wheels. In the Belgian Congo the automobile has been introduced to replace the native porters and to substitute land transportation wherever the difficulties of navigation are too great for convenient water transportation. Capt. Carton, who has been authorized to introduce the automobile, proposes to organize three routes, one toward Redjaf, branching to the Ouellé, another from Stanleyville to the Lualaba and the Tanganika, and a third through the caoutchouc regions of Kassai and Lomami to the Lualaba. Rapids and cataracts on water routes are to be passed on land by means of automobiles.

Finally, automobiles will find special application in field hospitals, securing a more prompt first aid to the wounded, and will be useful in hunting up the wounded on the field. They will also make excellent carriages for rapid-fire and machine guns; they will serve to transport more quickly the field bakeries and kitchens, thus giving the troops more rest; and they can be used with plows for rapidly making trenches for the troops, again saving much hard labor, and at the same time transporting most of the intrenching tools.

In Germany a searchlight automobile has been experimented with. It is a four-wheeled vehicle, run by a five horse-power petroleum motor, which can be made ready in three minutes and run for fifteen hours without renewal of fuel. This motor works a searchlight, and also furnishes four electric arc lights (of 800 candle-power each) for a flying field hospital.

In England the automobile gun carriage has been most fully developed. The Maxim Company has just constructed a very light machine gun, weighing only twenty-six pounds, and this is mounted in pairs on a tandem tricycle, the whole weighing about 320 pounds.

The whole subject, therefore, although still in the experimental stage to a large extent, opens up a fine field of investigation, and many of the problems are nearing practical solution, indeed are already so far solved as to insure the use of automobiles in the next war.

Power from the Waves and Tides.

"Cassier's Magazine" for September will say: "With visions of exhausted coal supplies, even though the end be far off, come thoughts of power from sources other than coal, from wind and water, and from the restless ocean waves and tides.

"Of water power there are a goodly number of important installations, principally in the United States, where electric power distribution from them over comparatively long distances has reached a high state of development. In Great Britain, on the other hand, power from waterfalls is a scarce commodity and not much is to be hoped for in this direction, so that there is something of interest in a recent forecast of the country, with every hill or other point of vantage studded with huge wind-mills for generating electricity, to be subsequently distributed to manufacturing centers. Many years, however, would have to elapse before coal would become sufficiently dear to make such a scheme worth considering in a practical way. Wave motors and tide-power schemes have been almost endless in number. The former have, in a few instances, been used for light pumping work at seaside places, but such pumping outfits have been very far from demonstrating that the wave motor could ever be seriously considered as a prime mover where large powers were demanded; in fact, the wave motor is a little better than a toy. As to power from the tides there is little to be said, except that much money has been wasted in vain endeavors to turn it to practical account. The tide-power scheme probably always will be alluring and also disappointing. The disappointment comes from the fact that very few people seem to take the trouble to figure out how much water and how considerable a fall are required to give any useful amount of power. A horse power for a day of ten hours, for example, would require something like 120 tons of water falling from a height of 100 feet, so that a 500 hp. factory, say, would need 60,000 tons of water at a 100-foot head. On the basis of 36 cubic feet of water to the ton, there would thus be over 2,000,000 cubic feet of water, and this would make a fair-sized pond, say, about 1,000 feet long, 200 feet wide, and 10 feet deep. There is in these few figures something that may help to open the eyes of the tide-power plan inventor, and of those who are in the habit of putting money into such things."

GAS ENGINES AND THE ECONOMY OF GASOLINE ENGINES FOR SMALL POWER.*

BY JOHN WILKES.

The slight expense at which small-sized gasoline engines may be operated is so marked that it is somewhat surprising that they are not more widely used even than they are. This may be due to counterbalancing disadvantages or defects in the gasoline engine as a motor, or it may be due to the fact that the gasoline engine, being a comparatively new thing, has not yet been thoroughly introduced, so that its advantages are not as widely known as they might be.

Defects and disadvantages the gasoline engine certainly has, but in spite of them there are situations where it is decidedly the best kind of power to use. It is to bring up for discussion before the members of this association the subject of the advantages and disadvantages of this motive power that the present paper is written

The title has been written The Economy of Gasoline Engines for Small Power, because, in the writer's opinion, a very large gasoline engine is not economical, compared with other kinds of power except under unusual conditions. However, the gasoline engine's half-brother —viz., the gas engine—is, for cases requiring large power, a very promising applicant for future requirements, and later on in this paper a few words will be said as to that.

Gas and gasoline engines are of an entirely different type from steam engines. In this end-of-the-century day we have wireless telegraphy, horseless carriages, smokeless powder and the gas engine might be called a "boilerless engine." There is no boiler about it. The pressure furnishing the power is generated by

*Paper read before the Engineering Association of the South at Nashville, Tenn.

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an explosion of gas in the cylinder of the engine.

The gasoline engine is an offshoot from the gas engine, or rather, more properly speaking, it is a gas engine, the gas being merely a particular kind—namely, the vapor of gasoline, so that in what follows of a general nature, wherever a "gas engine" is spoken of, it is to be understood that it is the same thing as a gasoline engine.

The idea of deriving power from the energy of an explosion by means of a motor is at least as old as Watt's invention of a means of turning the expansive force of steam to account.

Huyghens proposed in 1680 to make an engine in which the explosion of gun-powder in the cylinder of an engine would force the piston forward and so produce power. Something like this is what is done in a gas engine, so that in this sense the idea of the gas engine may be said to have antedated Watt's steam engine. However, it is hardly necessary to say that no practical working motor was made on this plan nor at this time. Passing over several interesting and more or less successful attempts at the problem, the first commercially successful internal combustion motor or gas engine was the Lenoir gas engine of 1860.

In this engine a mixture of gas and air was drawn into the cylinder for about half a stroke the valves closed, and the mixture ignited or exploded, producing thus for the last half of the stroke considerable pressure. This engine was double acting, like the ordinary steam engine—that is, it had the force applied on opposite sides of the pistons alternately. These engines were introduced commercially to some extent. They ran smoothly, quietly and satisfactorily but consumed rather a large amount of gas. As this was the first commercially successful gas engine, it will be seen that the steam engine had rather a long start of the gas engine, as Watt introduced the steam engine in 1769.

The next great step in advance was the introduction, in 1876, of the famous Otto gas engine; and as practically all engines built since operate on the same plan, a brief description of the Otto cycle, as it is usually termed—though, strictly speaking, Beau de Rochas first proposed it—will be given. The engine is usually single-acting, or, in other words, receives the pressure of the explosion only on the back of the piston, the front of the cylinder being open. The series of operations is as follows: The piston being at the back end of the cylinder and just ready to start forward, the inlet valve opens and a mixture of gas and air is drawn in as the piston moves forward. When the piston has reached the limit of its forward movement, the cylinder is full of the mixture of gas and air. All of the valves then close, and the piston on its return stroke compresses the mixture of gas and air. As the piston again starts forward the compressed gas and air are exploded or ignited by a spark, and the pressure thus produced is the source of the power of the engine. On the next stroke the products of combustion are expelled from the cylinder through the exhaust valve. The same cycle of operations is then repeated indefinitely. It thus appears that only one stroke in four is effective, and during the rest of the time the motion of the fly wheel is all that keeps the engine going. Very heavy fly wheels are thus a necessity. The Otto patent expired in this country in 1890, since which time numerous factories for the manufacture of gas and gasoline engines have sprung up all over the country.

With this brief sketch of the gas and gasoline engine, we will now consider the design, construction and operation of the engines commercially before the public in this country. The above described Otto cycle, which has been found by experience to be the most economical and best of any so far proposed, is used in nearly all engines made, and the differences in the engines are differences in the organs provided to carry out these functions, so to speak. In common, they all have large, heavy fly wheels, trunk pistons, single-acting cylinders, water jackets, and poppet valves. The points of difference are the method of making the mixture of the air and gas, or the measuring of the gasoline mechanism for operating the various valves, method of ignition, style of cylinder (vertical or horizontal), etc.

As between vertical and horizontal cylinders, it might be said that the arguments for one or the other are pretty much the same as in the case of the steam engine. Vertical cylinders require less floor space, have less drag and wear by the piston on the bottom side of the cylinder, and apparently adapt themselves more readily to multicylinder construction. There seems to be a tendency toward this as a type of American construction. However, many good makes of American engines—in fact, probably the majority—employ the horizontal cylinder.

The valves of gasoline engines are now nearly always made of the poppet type. The mechanism for operating them is of the most varied kind—spiral gears, bevel gears, eccentrics, push rods, spur gears, bell-crank levers, etc. The writer's preference is for a side shaft driven by spiral gears and operating everything—governor, inlet valve, exhaust valve, sparker, etc. This seems to be the simplest and neatest construction.

Mixing chamber and inlet valve are sometimes cast integral with the cylinder, sometimes bolted on. They often present a cumbersome, awkward appearance, are in the way if the engine is to be moved about, and are so placed that they offer great temptation to the men moving the engine to take hold of them in lifting the engine, with the result that they are broken off. The same is true as to many of the other parts of the engine, which are often made too small and delicate, stand out too far from the body of the engine, and are admirably adapted to take the weight of the whole engine—until they break off.

Gasoline may be fed by a pump feed or gravity feed. For very small engines the latter is preferable as being simpler. On large engines the pump feed is safer as regards fire, as the gasoline tank may then be outside the building, and there is no danger of the gasoline flooding.

Ignition is produced usually either by a hot tube or an electric spark; the former is the favorite method in England, and the latter usually in this country. If an electric spark is used, it may be produced by a battery, such as the Edison-Lalande, and a spark coil, or by a small dynamo made for the purpose and driven by the engine itself. The difficulty about the latter is that when the engine is not running the dynamo is "dead," so there is the difficulty of starting, and if a battery must be used then, it is less bother to have a battery that can be used all the time. Besides this, if the engine has work to do in which the load is thrown on and off suddenly, and the load is nearly or quite up to the capacity of the engine, there is a momentary slowing up of the speed of the engine when the load is thrown on, and this causes a diminution of the speed of the dynamo so that it will not furnish current enough to make a spark; the result is that the engine misses an explosion, causing further loss of speed, which decreases the current from the dynamo and so on until the engine stops. If electric ignition is used, it is best to have the sparking points or electrodes of platinum, or rather an alloy of platinum and iridium. The arrangement of the means for bringing the points together and separating them is important. The points should come squarely together without chance of missing, and the adjustment of them so that they will do so should not be long, tedious and difficult. The electrodes should be simple and the platinum points easily applied and also (as the scrap is very valuable) easily removed. If the design is such that platinum wire can be used to make the points, it would seem to be an advantage, as a short piece of the wire could be kept on hand and enough to make a point cut off as needed from time to time.

Batteries for portable engines are apt to be troublesome. There is a style of Edison-Lalande now made which has liquid-tight steel enameled jars, with rubber rings to seal them: these may be better for portable batteries than the ordinary style with porcelain jars. In general, simplicity, compactness, neatness of design, durability and fewness of parts should be aimed at by the designer of an engine that is to be handled by the class of mechanics that the gasoline engine usually falls into the hands of.

That for the practical needs of some people, whatever may be the case as to the general market, the gasoline engine might be simplified, is shown by the experience of the mines where the writer is employed. A small gasoline engine used for running a pump for pumping in the mines, having had some of the small, delicate parts constituting the gasoline injector broken, the whole injector, with governor, mixing valve, etc., was taken off and sent to the machine shop for repairs. The exigencies of the case requiring it, as the water was about to get beyond control, the engine was run all the same; and since then, the injector proving difficult to keep in proper adjustment on account of wear, etc., it has been cast aside, and we have the spectacle of the engine running—and running satisfactorily, too—with all these parts gone. The governor to the engine as it now runs is the work it has to do, and, in case of accident, the boy who runs the engine.

In the operation of gasoline engines there are several points at which they differ from steam engines. In the first place, they are not like steam engines, in which all that has to be done to start is to open the valve.

Gasoline engines have to be started. The wheels have to be turned by hand until the engine makes the first explosion, which, if the engine is all right and perfect, will be the first time it is turned over. Generally, though, everything will not be all right and perfect, and sometimes a good many turns are required, which soon gets to be very tiresome. Self-starters are usually furnished with the larger size engines (above 15 or 20 horse power); but with our 30 horse power engine we have never used it, starting always by hand. Gasoline engines run better after they get warmed up.

Gasoline engines, owing to the intense heat

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generated in the cylinder by the explosion, require a higher grade of cylinder oil than do steam engines. Batteries require renewing every two to seven months.

Repairs on gasoline engines used inside mines and where the grade of mechanical skill of those in charge of them is that of ordinary laborers, are likely to be disappointing to one who reads the testimonial books sent out by various makers and expects similar results in his own case.

One advantage of gasoline engines is that they require so small an amount of water, only a little for cooling the cylinder, which may be used over and over again. So that they may be said to require practically no water supply. Our 30 horse power engine uses about 300 gallons per day, whereas a steam engine of the same power would require 3,000 gallons. This has led to their use, even in pretty large units, in the arid regions of the West—Arizona, New Mexico, Colorado, etc. One 40 horse power engine there uses less than 40 gallons of water per day, according to a published report.

It may as well be acknowledged, in closing this division of the subject, that in operation gasoline engines are balky. Sometimes they will run, sometimes they won't; that's all there is to be said about it. What you do doesn't matter. When it gets in the humor to run, it will run; but neither you nor anyone else can tell what you did to make it go.

In testing small gasoline engines to ascertain what brake horse power they were developing, I have used the rope brake and spring balances. This is a cheap, simple, easily applied kind of brake, from which there is no danger of overheating the rim of the wheel to which it is applied and requiring no lubrication. The outfit for testing an engine up to, say, 10 horse power does not cost over two or three dollars. Indicating gas engines is said to be rather unsatisfactory and difficult. I have never tried to indicate one.

Small gasoline engines, once they are started, require practically no attention. It is to this principally that the economy referred to in the title is due.

The cost of the gasoline at present market prices for any size below 10 or 15 horse power is less than the cost of attendance alone for a steam engine and boiler; so that, even with coal absolutely free, one could not afford to use a steam engine and boiler of small size in an isolated location. There are many such cases where less than 15 horse power is needed at a location isolated from any large boiler plant. Of course if the power is needed at some point closely adjacent to a large boiler plant, where the only thing necessary is to put in the steam engine and connect to a steam pipe, the steam engine would probably be the cheapest; but if a fireman has to be employed to fire the boiler to make steam for a small, isolated steam engine, even though the fireman can be engineer as well as fireman, then the gasoline engine is cheaper for the total than the steam engine is for attendance only, to say nothing of fuel.

To show how cheap a gasoline engine may sometimes be, I may mention an engine of 7½ horse power which works under a varying load, the expense of running which is: For gasoline, 65 cents per day; attendance, 10 cents; total, 75 cents per day. A steam engine for the same work would cost: Attendance, $1.75; water supply, 10 cents: fuel (half ton of coal, say), $1.50; total, $3.35 per day.

Recently considerable interesting work has been done in the line of large gas engines using either natural gas or producer gas. A number of large engines are run on natural gas in Pennsylvania, Ohio and Indiana, and other States in the natural gas belt. With a good gas engine and cheap natural gas to use in it, the power consumer has something almost as good as a free water power, and something cheaper than the electrical energy as sold by the water power development companies, such as those at Niagara Falls.

Natural gas, however, is not at everybody's door, and the more general question of gas engines run by special gas made for the purpose is therefore of interest to a larger number of people. There are three different lines in this direction along which workers are experimenting—viz.: gas engines run on producer gas, gas engines run on blast furnace gas, gas engines run on the gas from by-product coke ovens.

The first (producer gas) has been successfully exploited in England by Dowson, and in France by Lencanchez, and also in this country, the plant at Danbury, Conn., and the recently installed plant of the Erie Railway at Jersey City, N. J.

So far, however, it has only been from anthracite coal that this producer gas for gas engine purposes has been successfully made, in this country at least.

There is no apparent reason why gas from the Semet-Solvay and other by-product coke ovens should not be suitable for use in gas engines and furnish very cheap power. The blast furnace being incidentally a huge gas producer, the idea of using the surplus gas from it in gas engines has occurred to several people.

The most described plant of this kind is the one at Seraing, Belgium, though there are several others in England and elsewhere. There is now in operation at Seraing a 200 horse power gas engine run on blast furnace gas, and the results are said to be satisfactory and very economical. Very large engines are now being built in Germany and France for this purpose, some as large as 500, and even 1,000 horse power.

The thermal efficiency of gas engines is much higher than that of steam engines, and the efficiency as measured in pounds of coal used, which is what a practical man is interested in, is also better, being for gas engines equal to about one pound of coal per horse power per hour; while it is a very good steam engine that comes under two pounds per horse power per hour, and ordinary engines run from four to eight or ten, even sometimes higher.

Now if gas engines are so much superior to steam engines in economy, why are they not rapidly taking the place of steam engines? The answer is that it is principally because the gas engine is hard to start, balky, of large dimensions in comparison with the power developed, and a new thing. Until very recently they were not made in large sizes, rarely over a 100 horse power. This is, as stated above, not now the case. I think we may look to see the gas engine assume a very prominent place in the future, and perhaps it will not be a very distant future, either.

THE RENO INCLINED ELEVATOR.

A new attraction has been added at the Crystal Palace, says the London "Electrician," in the form of an "inclined elevator." This, the directors of the Crystal Palace hope, will entice a greater number of people to the gallery of their large building, for it appears that the exhibition of pictures there is much neglected by the public. Elevators of this type have been in operation some years in the United States, but the "Reno" elevator exhibited at the Crystal Palace is different in some respects from the latter.

The elevator consists of a moving floor and a hand-rail moving at the same speed, inclined at an angle of 25 deg. with the horizontal. It is carried on a steel framework bolted at the top to the girders supporting the gallery, and secured in a similar manner below. The moving floor is formed of a series of transverse slats or treads attached to an endless chain which passes over a sprocket wheel at each end. These slats are 3 feet 6 inches in length (i.e., in the direction perpendicular to the chain) and are only a few inches in width, corresponding of course to the length of a link of the chain. They have fastened to them a series of rubber covered longitudinal ridges, each being ⅜ inches wide and 1 inch high, to serve as a comfortable footing for the passengers. Beneath each wooden slat are attached, one at each end, small wheels made of a material termed "Hemacite" which appears to be a compound having rubber and several other substances in its composition. These rollers travel upon angle-iron tracks both on their upward and downward paths, and ensure easy and noiseless running.

FIG. 1.—RENO INCLINED ELEVATOR AT THE PARIS EXHIBITION.

The upper sprocket wheel is driven through a belt and spur gearing by 9 hp. electric motor of American manufacture, supported on the same framework as the elevator. The speed of the motor is 650 revolutions per minute, which is reduced to 14 revolutions per minute for the sprocket wheel, and the inclined floor moves at about 90 feet per minute.

At the top end of the incline is a cast-iron plate which serves as a landing stage; and forming part of this is a sort of comb the prongs

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of which are curved to follow closely the contour of the chain of slats as it arrives on the sprocket wheel. These prongs are so proportioned that they fit in exactly between the longitudinal ridges on the slats already mentioned, and in this way the feet of the passengers are moved off smoothly on to the landing stage. So perfect is this action that a handkerchief or paper dropped on the incline is not carried round beyond the top but remains on this comb until it is picked up.

In order to prevent the machine from running back if it stops while passengers are on it, for instance, by the motor fuse blowing—a ratchet wheel and pawl are fitted to the lower sprocket wheel, and another simple pawl rests on the under part of the chain at its center.

The moving hand-rail is formed of an endless steel chain, covered with a flexible rubber covering, passing over sprocket wheels much in the same way as the inclined track itself, and moving with the same peripheral velocity. In this case, however, it is necessary to provide against the chain being pulled out of its course too much by the passengers, and this is done by the use of links, the under side of which have little cross pieces which slide in grooves cut in the fixed bannister which this moving hand-rail covers. At the upper end the moving rail passes down over its sprocket wheel, and thus the passenger is obliged to release it.

Five of the inclined elevators at the Paris Exhibition are also of the "Reno" construction, and one of these is illustrated in Fig. 1. Fig 2 shows the general arrangement of the elevator at the Crystal Palace.

The following are the makers' estimates of the horse-power required for working an inclined elevator 19 feet high:

1.2 hp.	Elevator free.					
2.36 "	"	carrying up	600	passengers	per hour.	
2.8 "	"	"	" 1,200	"	"	
2.95 "	"	"	" 1,500	"	"	
5.15 "	"	"	" 2,250	"	"	

An interesting modification of this elevator is one especially suitable for docks, etc., in which goods have to be transported from one level to another, the difference in level being not, however, a fixed quantity. One end only can therefore be fixed, and the apparatus consists of a trussed steel framework which carries an endless traveling platform. This passes around suitable wheels at each end, those at the upper end being driven by an electric motor. The machine is mounted on swiveled wheels, and can be moved easily to any position on the dock or in the warehouse; being on a self-adjusting base, it can then be raised to the required position by pulley and tackle. Such an elevator, 38 feet in length, weighs about 45 cwt. This appliance should prove even more useful than the fixed pattern.

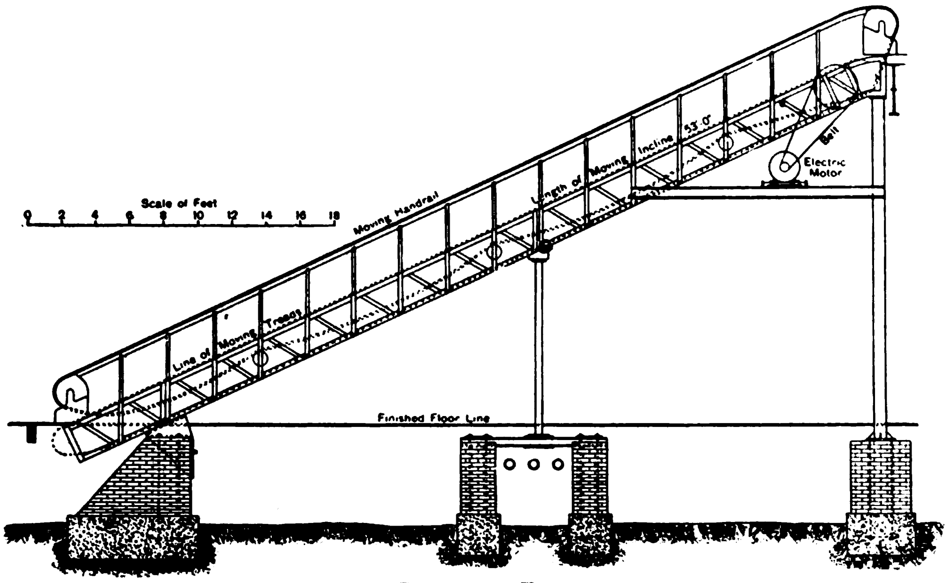

FIG. 2.—ELEVATION OF THE RENO INCLINED ELEVATOR AT THE CRYSTAL PALACE.

LONDON NOTES.

[From our London Correspondent.]

The British Association Convention.

On Wednesday, September 5, the annual convention of the British Association for the Advancement of Science opens in the city of Bradford. The president for the year is Prof. Sir William Turner, who occupies the anatomical chair of Edinburgh University. The text of his address, which will be delivered to the entire assembly on the evening of the opening day, will be "Progress in Biological Science." The following morning as usual the proceedings will be divided up into sections. Section A, in which papers on Mathematical and Physical Science are considered, will be under the presidency of Dr. Joseph Larmor, F. R. S. Nothing has yet been officially published as to the exact character of the various contributions, but in unofficial publications it is stated that Dr. Larmor in his address will give a review of the change of ideas which has recently become current regarding the scope and method of physical explanation. In a forecast it is stated that "the acceptance on the Continent, in consequence of the brilliant work of Hertz, of the views originated in England regarding the nature of electric actions and their dependence on the ether has been largely accompanied by an elimination of the dynamical explanations which formed a main feature of Clerk-Maxwell's theory. This makes it a matter of fundamental importance to determine, if possible, how far purely descriptive methods can avail without appeal to a dynamical foundation; it involves consideration of the mode of representation of the physical activities of the material atoms, and it raises the question whether denial of direct action at a distance necessarily implies transmission by simple stress such as occurs in a material elastic frame." Among other proceedings in Section A there has been a discussion arranged on Ions. This will be introduced by Prof. Fitzgerald.

The address to the Chemistry Section, B, will be delivered by Prof. H. W. Perkins, and will deal with "The Modern System of Teaching Practical Inorganic Chemistry and its Development."

The Economic Science and Statistics Section will have a few matters of electrical interest before it. "Municipal Trading," which has commanded such widespread attention during the past few months in view of the proceedings of the Parliamentary Committee (which, by the way, has had to close its proceedings without completing its investigations or preparing a report because of the prorogation of Parliament), will be brought up by Mr. Arthur Priestman.

The only other section of importance, from the writer's point of view, is the Mechanical Science Section, G; in fact this is the section in which practical electrical engineering papers and discussions occur. Mr. J. B. C. Kershaw will contribute on "The Comparative Cost of Power Generation by the Steam Engine, Water Power and Gas Engines." This paper will presumably be an amplification of the paper introduced and circulated in some quarters—but not read—on the occasion of last year's convention at Dover. Some engineering journals published the first part of the paper last year under the impression that it had been accepted and read. This year the topic will of course be very opportunely brought forward in view of the increased attention which has lately been devoted to the question of generating and distributing electrical energy on a large scale in certain English districts.

Mr. Alfred H. Gibbings, the late Corporation electrical engineer of Bradford, will deal with "The Design and Location of an Electric Generating Station." A new form of self-registering electric rain-gauge will be described by Mr. J. W. Binnie. The advantages of automobiles for electric street traction, also a topic of considerable discussion here lately, will be discussed by Mr. J. G. W. Aldridge.

Sir William H. Preece, who recently championed the cause of the high speed electric railway scheme for Manchester and Liverpool before a Parliamentary Committee, will describe the system, and in view of the regret which is felt at the dismissal of the proposal, an interesting discussion may be looked for.

"Steam Raising and Smokeless Combustion" is to be brought up by Mr. Armitage, and Prof. Goodman will give an account of a new form of calorimeter for measuring the wetness of steam.

Prof. Hele Shaw, who is professor of engineering at Liverpool University College, will speak on "Resistance on Roads" when tramway and railway papers come forward, and Mr. Dawson, the deputy surveyor of Bradford, will describe recent tramway construction with special reference to the Demerbe rail which has been adopted at Bradford for the electric trolley lines.

"The Resistance and Acceleration of Trains—Measurement of Tractive Force," is the title of a paper by Mr. A. Mallock, in which will be given an account of the author's recent experiments on electric and other railways to determine the acceleration, tractive force and the running resistance to which trains are subjected.

Other matters to come before the Mechanical Science Section, of which Sir Alexander Binnie is president, include the description of a new maximum demand meter invented by Mr. Barker and Prof. Ewing.

These announcements lead one to anticipate something better from the 1900 proceedings

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than from those "gigantic picnics" of the last year or two.

CONCERNING HOT WIRE INSTRUMENTS.

To the Editor of Electricity.

Sir: I note in your issue of August 1st an article on Electrical Measuring Instruments, by J. Franklin Stevens, this article having been delivered before the Franklin Institute of Philadelphia.

I wish to call attention to some of Mr. Stevens' remarks concerning hot wire instruments, which I think need some modification. I quote Mr. Stevens' article in full as follows:

"As a shunt ammeter the hot wire instrument is a distinct failure, for, while the manufacturers claim it can be operated on .3 volt drop for full scale, my personal experience has shown a drop of 6 volts to be necessary." I do not know how much experience Mr. Stevens has had, evidently not as much as some other people, for hot wire ammeters with shunts have been, and are being made every day that require even less than .3 volt drop for full scale deflection. The Stanley Electric Manufacturing Company are making hot wire shunt ammeters from 100 ampere to 6,000 ampere capacity with an average drop of .26 volt for full deflection. We are prepared to furnish any one wishing to purchase hot wire shunt ammeters, from 100 ampere maximum to 6,000 ampere maximum capacity, a guaranteed fall of potential not exceeding .3 volt.

Again to quote Mr. Stevens: "It has been shown that these ammeters (hot wire) when calibrated on direct current are not accurate within 10 per cent. when used on alternating currents unless the reactance in the shunt is exactly equal to the reactance in the instrument." Here Mr. Stevens claims that the least possible error that the instrument can have from this cause is 10 per cent. Such a statement is manifestly absurd.

In themselves the reactance of the shunt and the reactance of the instrument introduce no error. An error is introduced only when the ratio of the reactance voltage of the shunt to its ohmic drop is different than the ratio of the reactance voltage of the instrument and its ohmic drop.

In the April issue of the "American Electrician," Mr. E. A. Wagner called attention to the fact that if the reactance voltage of the shunt was 50 per cent. of its resistance drop, and the instrument had no self-induction, then the instrument might be in error to the extent of 10 per cent. I suppose it is from this article that Mr. Stevens drew his inspiration. Mr. Wagner has since explained that he merely wished to call attention to the fact that such an instrument could be made. Of this there is no doubt, if any one wanted it. In practice, such a condition is impossible, as both shunt and instrument are a part of the same circuit, and as such have their proportionate share of the reactance.

If the instrument and shunt are carefully designed, so that the ratios of reactance and resistance approximate each other, the error introduced becomes exceedingly small. In fact in over 1,000 instruments calibrated on direct current, and checked on alternating current, I have never found an instrument in error when the standard shunts and leads have been used.

W. J. Lloyd.

Pittsfield, Mass., Aug. 21, 1900.

TENTH ANNUAL MEETING.

The American Electro-Therapeutic Association to Assemble in New York.

Members of the medical and electrical profession are taking great interest in the tenth annnual meeting of the American Electro-Therapeutic Association, to be held at the Academy of Medicine, 17 West 43d street, New York City, September 25 to 27 inclusive. Dr. Walter H. White, of Boston, is president, and Dr. George E. Bill, of Harrisburg, Pa., is secretary of the association. Dr. Robert Newman, of 148 West 73d street, New York City, is chairman of the committee on arrangements, and can furnish information regarding the meeting. The headquarters of the association during the meeting will be the Hotel Bristol, at the corner of Fifth avenue and 42d street. The following is the general programme for the meeting:

First day, Tuesday, September 25—9 a.m., executive session: 10 a.m., general meeting and three papers; 2 p.m., visit, by invitation of President H. Sanderson, to New York Electric Vehicle Transportation Co., 1684 Broadway; 3 p.m., visit, by invitation of New York Telephone Co., to central station; 4 p.m., afternoon session at Academy of Medicine, 17 W. 43d street: discussion of Tuberculosis and three papers; 8 p.m., evening session, six papers.

Second day, Wednesday, September 26—9 a.m., executive session; scientific session, discussion on gynecology and four papers: 2 p.m., visit to Metropolitan power house, 96th street and 1st avenue; 3 p.m., Brooklyn Bridge, inspecting the machinery of the cable cars; visit to a down-town station of the Telephone Co.; 4 p.m., afternoon session, seven papers; 8 p.m., executive session, private, election of officers; 9 p.m., lecture by Mr. C. T. Child.

Third day, Thursday, September 27—10 a.m., morning session, 10 papers; 2 p.m., Riverside Drive, Grant's Tomb; visits, by invitation, to Columbia College, to library and laboratories, St. Luke's Hospital, Amsterdam avenue and 113th street, inspection of the Episcopal Cathedral.

The American Institute of Electrical Engineers in England.

(From the London Electrical Review, August 17, 1900.)

On Sunday, August 12, about 55 members and guests (including many ladies) belonging to the British and American societies left Paddington at 10:05 a.m. for Henley, where electric launches were in waiting. In these the party was taken nearly to Shiplake, returning to Henley for lunch at the Red Lion. Earl Russell and Mr. C. H. Stearn joined the excursionists at Henley with their steam launches, and took some members of the party aboard.

At lunch, Prof. Perry, who presided, proposed the toasts of "The Queen," and "The President of the U. S. A."; the toast of "Our Guests" was jointly proposed by Mr. Siemens and Mr. Mark Robinson, and responded to by Mr. Carl Hering and Mr. W. J. Hammer. This dual system of proposers in series was, as announced from the chair, worked out by the President (Prof. Perry), and was tried for the first time at this lunch. It is, therefore, presumably the subject of provisional protection. We might suggest as an improvement that the toast having been duly moved and seconded, the motion be put to the vote!

After lunch, the launches and lunchers proceeded to Maidenhead, partook of tea at the Thames Hotel, and returned by special saloon cars to Paddington. Thanks to the fine weather, the trip was in every way most enjoyable. On Monday morning the Electrical Standards Laboratory of the Board of Trade was visited, the party being received by Mr. Trotter, Mr. Renne and Mr. Crawley; as an alternative, some of the visitors were shown over the G.P.O. Telegraph Department by Mr. Gavey.

In the afternoon a visit was paid to the Central London Railway generating station and to the sub-station at Marble Arch, under the guidance of Mr. Cunningham and Mr. T. Stevens. Afterwards, proceeding by way of Bond Street station, which was specially opened for the occasion, the party went to the Davies Street station of the Wesminster Electric Supply Corporation. In the evening a dinner was given in honor of the American visitors.

On Tuesday an excursion was made to Chatham Dockyard, where the party was received by the Admiral Superintendent (Admiral Holland), and shown over the workshops and the first-class battleships Albemarle and Irresistible by the civil engineer. Next the visitors were taken over the electrical section of the School of Military Engineering by Major Carr, R.E., and were afterwards entertained at lunch by General Sir Thomas Fraser at the R.E. mess. Later on they attended a garden party at Lady Fraser's.

On Wednesday the British and American electrical engineers proceeded to the Paris Congress.

Among the principal American guests present at the various functions, were: Mr. Carl Hering (President Amer. I.E.E.), Dr. A. E. Kennelly, and Prof. Crocker (past President, Amer. I.E.E.), Mr. E. O. Mailloux, Mr. W. J. Hammer, Mr. R.W. Pope (Secretary, Amer. I.E.E.), and Messrs. H. Ward Leonard, H. D. McVay, J. G. White, W. C. Burton, D. Adamson, E. H. Mullin, L. A. Phillips, W. D. Brown, J. R. Edwards, B. J. Arnold, I. W. Henry, E. G. Bernard, R. O. Heinrich, W. J. Clarke and R. W. Lohmann.

Meeting of the International Association of Municipal Electricians.

The Fifth Annual Meeting of the International Association of Municipal Electricians will be held in Pittsburg, Pa., September 25, 26 and 27, 1900. Papers on the following subjects will be read and discussed:

"Benefits to be Derived from Our Association," by Capt. Wm. Brophy, Chief Electrician Wire department, Boston, Mass.

"Contact Points," by Frank C. Mason, Superintendent of Police Telegraph, Brooklyn, N. Y.

"Trials and Troubles of Instituting and Enforcing Municipal Inspection and Control," by M. G. Canfield, Superintendent Fire Alarm Telegraph, Grand Rapids, Mich.

"Automatic Fire Alarm Systems," by Charles Burger, manager of the Boston Thermostatic and Automatic Fire Alarm Company, Boston, Mass.

"Advantages and Disadvantages of Carrying High and Low Potential Conductors upon the Same Poles." This subject will be presented by an able electrician for general discussion.

The headquarters will be at Monongahela House, where all sessions of the Association will be held in the Banquet Hall; this hotel has been the headquarters for conventions for the past fifty years.

All delegates and visitors will be accommodated there at $3 and $4 per day, American

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plan; those who desire European plan can be accommodated at the Griswold Hotel for $1 per day and upwards; at Newell's Hotel, Henry Hotel, Lincoln Hotel, Duquesne Hotel, Schenley Hotel for $2 per day and upwards; also at the Seventh Avenue Hotel and Anderson Hotel, American plan, $3 per day and upwards.

There will be two sessions daily, at 9.30 A. M. and 2.30 P. M., respectively.

During the evening of the 25th, there will be a trolley ride on special cars over the Consolidated Traction, United Traction and the Monongahela Street Railway Company's lines, which cover many miles of the most beautiful and picturesque scenery in this country.

During the afternoon of the 26th, there will be carriage rides over the boulevards and through the parks for the ladies, and in the evening theater parties and inspection of some of the large iron and steel mills by those who desire to see them.

The afternoon and evening of the 27th, there will be an excursion on the steamer Mayflower down the Ohio River to Davis Island Dam, seven miles and return, then up the Monongahela River forty-five miles and return, during which there will be a banquet served and during the entire trip the guests will be entertained by the Tariff Club Quintet, C. F. Harris, manager, and a musical programme arranged and directed by Professor H. P. Ecker, city organist of Allegheny, Pa. On this trip all will have a good view of many of the largest manufacturing plants of the world-famous city of Pittsburg.

So far as possible arrangements will be made for members who desire to inspect the works of the Westinghouse Electric & Manufacturing Company, at East Pittsburg, the Westinghouse Air Brake Company, at Wilmerding, and the Standard Underground Cable Company, of Pittsburg.

LEGAL NOTES.

The Supreme Court of Washington has rendered a decision favorable to the Seattle Electric Company in its franchise case, reversing the decision of the lower court. This gives the company a complete railroad franchise for 35 years on all its present lines as well as on several new ones.

Application has been made to Circuit Judge Hazel to have the Clyde Gas & Electric Company of Clyde, N. Y., declared an involuntary bankrupt. Argument on the application will be heard at Buffalo on September 4. The corporation went into voluntary dissolution April 7 last. The nominal assets are $71,344.82, the actual, $40,000; liabilities, $50,279.21. The corporation was formed by merging the Clyde Gas with the Clyde Electric Company, then an Acetylene Gas plant installed, and steam heating and electric power taken. Money ran short, and Clyde was left without light or heat.

The Buffalo (N. Y.) General Electric Company has recovered a municipal court judgment of $72.04 against William McCarthy. The company alleged that it had delivered to McCarthy a "quantity of electrical currents," commonly known as electricity, for which he did not pay.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended August 22:

Antwerp, 29 packages, $2,557; 6 cases, $374; Argentine Republic, 159 packages, $6,671; Barcelona, 4 cases motors, $180; Brazil, 1 case, $41; 142 packages, $6,747; Bremen, 2 packages, $780; British East Indies, 1 case, $72; 3 cases motors, $800; British Guiana, 16 packages, $268; British Possessions in Africa, 195 cases, $22,030; British West Indies, 44 packages, $1,249; Central America, 14 packages, $233; China, 48 packages, $864; Chili, 6 cases, $91; Cuba, 18 cases, $1,439; Dutch West Indies, 5 cases, $66; Genoa, 8 cases, $694; Hamburg, 23 packages, $4,891; Havre, 198 cases, $16,177; Hayti, 1 package, $50; Japan, 216 packages, $10,760; 39 boxes motors, $8,953; Liverpool, 63 cases, $6,693; London, 86 cases, $3,113; 43 packages, $3,733; Marseilles, 17 cases, $2,008; Mexico, 14 packages, $1,039; 1 case motor cars, $200; New Zealand, 25 cases, $1,203; Peru, 11 packages, $364; Philippines, 80 cases, $1,608; 7 cases motors, $583; Preston, 17 cases, $750; Siam, 10 packages, $490; Southampton, 31 packages, $2,320; 1 case, $10; Uruguay, 2 cases, $200; Venezuela, 6 packages, $23; 2 cases motors, $45.

PERSONAL MENTION.

Mr. John M. Pendleton, one of the founders of the New York Electrical Society, died at his residence in New Brighton, N. Y., recently.

Mr. Arthur B. Shepard, who is manager of the General Electric Company for the Northern Ohio and Indiana district with an office in Cleveland, recently returned to his duties after a sojourn in Saratoga.

Mr. Charles H. Frisbie, of Jackson, Mich., prominently connected with the Kalamazoo Valley Electrical Company and electric railway interests, lately had a narrow escape from asphyxiation.

Mr. Thomas McLean, manager of the Toledo Traction Company, was recently presented with a silver loving cup by the Ohio Electrical Light Association in acknowledgement of the members' appreciation for the entertainment in which Mr. McLean had taken such an interest to provide for them while in Toledo.

INCORPORATIONS.

The New Kensington Electric Light, Heat & Power Company, New Kensington, Pa. Capital stock, $75,000.

The General Electric Storage Battery Company, New York City. Capital stock, $125,000. Thomas J. Ryan is interested.

The Aluminum Storage Battery Company, Chicago, Ill.—to manufacture storage batteries. Capital stock, $2,500. Incorporators: M. H. Casler, W. P. Johnson and C. K. Chamberlain.

The Bellefonte Electric Company, Bellefonte, Pa.—to manufacture light, heat and power. Capital stock, $5,000. Incorporators: J. C. Miller, E. L. Hoy, C. W. Boyer, E. L. Orvis and S. D. Gettig, all of Bellefonte.

The Citizens' Electric Light & Power Company, Sandusky, O. Capital stock, $100,000. Incorporators: John Sherwin, J. B. Hanna, H. A. Everett, B. Mahler, W. H. Price, George A. Stanley, James Hoge, C. H. Stewart and Charles W. Wasson.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED AUGUST 21, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

656,207. Trolley-Wheel Henry A. Osborne, Plainville, Conn. Filed Dec. 6, 1899.

656,276. Electric-Railway System. Louis E. Walkins, Springfield, Mass. Filed Dec. 15, 1898.

656,511. Electric-Railway System George L. Campbell, New York City, assignor to the International Electric Traction Company, same place. Filed Dec. 15, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

656,211. Electric-Lamp-Supporting Bracket for Desks. Stanley S. Porter, Melrose, Mass. Filed Jan. 25, 1900.

656,431. Cord-Adjuster for Electric Lights. Frank H. Stewart, Camden, N. J. Filed May 9, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

656,165. Electric Generating Apparatus. John H. Bickford, Salem, Mass. Filed Dec. 8, 1899.

656,282. Circuit-Breaker. George S. W. Brubaker and William S. Twining, Philadelphia, Pa. Filed Nov. 20, 1899.

656,284. System of Non-Interchangeable Contact Parts. Moriz Froschl, Vienna, Austria-Hungary, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill., Filed Sept. 2, 1899.

656,291. Switch. Ernst W. G. C. Hoffmann, Charlottenburg, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Sept. 2, 1899.

656,451. Automatic Circuit Interrupter. Lionel Fleischmann, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 12, 1899.

656,455. Summation-Meter. Jesse Harris, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 17, 1899.

656,473. Electric Controller. Charles J. Reed, Philadelphia, Pa. Filed Jan. 13, 1899.

656,522. Apparatus for Converting Alternating Currents into Continuous Currents. Max Deri, Vienna, Austria-Hungary. Filed July 6, 1899.

656,545. Electricity-Meter. George Hookham, Birmingham, England. Filed July 9, 1900.

656,571. Controller for Electric Motors. Thomas S. Perkins, Idlewood, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Jan. 13, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

656,333. Telephone-Switchboard Apparatus. Thomas C. Wales, Jr., Newton, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Nov. 7, 1899.

656,336-656,384. Switchboard for Telephones. Milton I. Baird, Glenfield, Pa. Filed March 1, 1900, Dec. 1, 1899.

MISCELLANEOUS.

656,158. Confiner of Wires for Electrical Connections. Charles F. Ash, New York City. Filed Dec. 11, 1899.

656,177. Commutator. John T. H. Dempster, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed June 8, 1900.

656,192. Manufacture of Pipes or Conduits for Electrical Conductors. Albert H. Howard, London, England. Filed May 18, 1900.

656,266. System of Electrical Distribution. Harry F. Roach, St. Louis, Mo. Filed July 10, 1899.

656,292. Electrically-Operated Submarine Torpedo. Peter C. F. Hoffmann, Kiel, Germany. Filed April 30, 1898.

656,305. Process of Electrolytically Extracting Zinc from Ores. Wilhelm Strzoda, Falenze, Germany. Filed Jan. 20, 1899.

656,309. Electric Burglar-Alarm. Paul V. Vandevelde, New York City. Filed Feb. 16, 1900.

656,323. Electric Bicycle. Albert Hansel, Zeits, Germany. Filed Feb. 1, 1899.

656,324. Controlling Electrical Currents. Arthur B. Holmes, Liverpool, England. Filed April 11, 1899.

656,372. Guard for Controller-Brushes. Andrew L. Riker, New York City. Filed Jan. 8, 1900.

656,421. Brush-Holder Ring. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 5, 1898.

656,484. Combined Visible and Audible Signal. Eugene W. Vogel, Chicago, Ill., assignor to David S. Wegg, same place. Filed July 7, 1899.

656,454. System of Non-Interchangeable Electrical Contact Parts. Moriz Froschl, Vienna, Austria-Hungary, and Rudolf Hundhausen, Wilmersdorf, Germany, assignors to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed March 6, 1899.

656,558. Electrolytic Apparatus. Gerome Loiselet, Paris, France. Filed Nov. 7, 1898.

656,578. System of Electrical Distribution. William J. Davis, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed June 29, 1900.

656,599. Process of Manufacturing Carbids. Reuben Doolittle, Chicago, Ill., assignor to Mary V. Doolittle, same place. Filed Oct. 16, 1896.

656,600. Means for Manufacturing Carbids. Reuben Doolittle, Chicago, Ill., assignor to Mary V. Doolittle, same place. Original application filed Oct. 16, 1896. Divided and this application filed Oct. 20, 1899.

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THE TELEPHONE WORLD.

New Telephone League.

The independent telephone companies of the State of Indiana have formed an organization known as the Indiana Mutual Telephone Association. The object of the association is to see that all members are properly assessed by the State tax board. The claim is made that some companies are taxed unjustly, and the association will attempt to secure as nearly as possible an equal rate, and will ask that all companies be assessed on a basis of their earning capacity, taking into consideration the wear and tear of the plants, etc.

There are between 156 and 170 independent telephone companies in the league. All are not members, but they are affiliated. Harry B. Gates of Indianapolis is secretary and treasurer of the organization. At a meeting held some time ago a tax committee was appointed to see that all companies were taxed justly and it is due to the work of the committee that so many appeals have been filed.

George P. Haywood, of Lafayette, representing the Lafayette Telephone Company, appeared before the board recently in an appeal from the assessment of his company. Mr. Haywood maintained that his company was not making any money and insisted that the present assessment of $41,680 should be reduced to $25,000.

W. H. Ernest, representing the United Telephone Company and also the independent lines in general, said that there were two basic patents pending before the United States Supreme Court, and that if the Bell Company won the case the property of the independent lines will be worth little or nothing. Mr. Ernest called attention to the danger of damage to telephone property, and said that in his opinion the companies were in many cases assessed too high.

William Duff Haynie, of Chicago, appeared before the board and asked for a reduction in the assessment of the Elgin, Joliet & Eastern.

W. M. Lyford, of Chicago, representing the Chicago & Eastern Illinois Railroad also asked for a reduction in the assessment of his company.

It is now reasonably certain that the Buffalo Telephone Company, the new concern which proposes to compete with the Bell monopoly in Buffalo, N. Y., will go before the common council early next month and ask for the privilege of stringing wires, erecting poles and laying conduits. The company has been busy obtaining subscribers and will be ready at that time to convince the aldermen and councilmen that the people of Buffalo are anxious to be released from the extortionate charges and indifferent service of the corporation which has been doing business there according to his own sweet will. "Buffalo people are waking up to the fact," said a telephone man recently, "that there is not another city of its size in the country where telephone charges are so high and the service so poor. There ought to be at least 15,000 telephones in Buffalo whereas the Bell Company has only a few over 5,000. This is all due to the discouraging tolls they charge. In Rochester the independent company is rapidly taking the business away from its older rival after a hard fight was waged by the Bell Company to keep out competition. The new company, I am told, has 2,500 subscribers already, the rates are lower and the service better than ever before."

Mr. J. A. Nolan, a representative of the Munsen Electric Company of Elyria, O., recently appeared before the Batavia, N. Y., board of aldermen, asking to be granted a franchise to set poles, string wires and operate an up-to-date telephone system. He explained that this company had in successful operation a system of from 2,000 to 3,000 telephones, and it was particularly anxious to secure a franchise in Batavia, as that would make a link in the chain from Buffalo to Rochester, N. Y. He then tendered the formal application to the board. Upon motion of one of the aldermen the matter was referred to the board as a committee of the whole to report at the next meeting.

The Huntington (W. Va.) Mutual Telephone Company is suffering much annoyance from people in the suburbs shooting at birds on its telephone cables. A short time ago all the 'phones in the West End were rendered useless by the cables being cut with bullets. It was with great difficulty that the perforations were discovered. The telephone company has now offered a reward of $100 for the arrest of anyone discovered shooting at birds on its cables.

The extensive plant of the Maryland Telephone Construction Company of Baltimore, Md., was destroyed by fire, the origin of which was unknown, on the 22d inst. The loss is estimated at $112,000, of which $75,000 is on the building, and the balance on the stock and tools.

The city of Cambridge, Mass., uses thirty-five telephones, for which it pays the New England Telephone & Telegraph Company $2,600 a year.

Advance in Telephone Rates.

It is said that the Southern Bell Telephone people will shortly announce an increase in rates at Norfolk, Va., which will exactly double the rates now in effect; that is, $30 for business houses and $18 for residence 'phones. The new rates will be $60 and $36. The Bell Company cut its rates in half about three years ago in order to compete with the Southern States Company, which established an extensive system in that locality. The increase of rates means that the Bell Company has abandoned the competition so far as low prices go, at any rate.

Since the announcement that the Bell Telephone Company will double its telephone rates in Norfolk, Va., Portsmouth and Berkley, after the first of next month, several gentlemen are contemplating the organization of a new telephone company, purely a local company, to offer 'phones at much lower rates than the Southern Bell will charge. This action is being discussed upon the assumption that the Bell Company has absorbed the Southern States Company, and will make a uniform high rate. It is said that it is not improbable that the councils will be asked at their next meeting for a franchise for a new company, the franchise fixing a maximum as well as a minimum rate to be charged by the new company.

The advisability of connecting up the different school buildings throughout the city of Reading, Pa., by telephone, is being considered by the school controllers. A careful inquiry has been made of this subject as to what has been done in other towns, and it has been ascertained that wherever the schools have been connected by telephone they claim the service is indispensable. Citizens in communities where the plan has been adopted approve of the reasonable expense incurred by the controllers. Many in Reading hope it will soon be added to the school system.

The bond given by the Binghamton (N. Y.) Telephone Company, as a guaranty of the faithful performance of the work of constructing a telephone system under the franchise granted by the common council, was recently filed at the office of City Clerk Kane. As required by the council, the bond is for $10,000, and the sureties are: W. W. Newell, Postmaster J. H. Roberts, ex Sheriff, A. G. Wales, Police Commissioner T. B. Crary, George C. Bayless and Street Commissioner W. E. Carpenter.

City Electrician Davis of Auburn, Me., has started a movement for placing as many of the electric light and telephone wires as possible upon one set of poles. In some localities there is a pole for every wire. He also advocates other reforms in the street wiring. He has sent a communication to the city government defining his position and the committee on street lights, to whom the matter was referred, will meet to consider it.

The Union Telephone Company of Alma, Mich., has decided to declare a semi-annual dividend of 4 per cent. Since January 1 the company has built 55 miles of new line and reconstructed 105 miles with metallic wire. The total number of miles of line now in operation is 450 with 840 'phones, 300 of which have been added since January 1.

A movement is being projected in Kentucky to build a telephone line from Procter mines, south of Jellico, and Jellico to Williamsburg, Corbin and thence to London and the Pittsburg mines. The scheme was inaugurated at Williamsburg by an independent company, composed of Messrs. Will McLain, the Mahan brothers, J. T. Siler and others.

The Troy Telephone & Telegraph Company, of Cohoes N. Y., is laying a large cable on the poles to contain its telephone wires. It is the intention of the company to remove the wires that have been used separately, thus preventing the lines from crossing and contributing to the unsightliness of the present system. The cable will be extended so as to pass through the principal streets of that city.

The Bell Telephone & Telegraph Company of Montgomery, Ala., is going along steadily in its arrangement to have its wires put underground. It will not take very long to have the change made, and before many months numbers of the poles and wires which overhang the streets of that city will be removed.

The Rawson Electric Company, which has been granted a franchise to construct and operate a telephone plant in Lockport, N. Y., evidently expects to begin work there shortly.

News from San Francisco, Cal., states that one of the largest combinations of capital ever effected on the Pacific coast is about to go into operation. All the telephone companies in that State, Oregon, Washington, Nevada, Idaho and Arizona, have been consolidated under a gigantic corporation. This company is capitalized at $15,000,000.

Several important changes will take place in the general office of the Pennsylvania Telephone Company, of Harrisburg, on or about September 1. Mr. A. D. Reese, the local manager of the Lancaster district, with headquarters in that city, will be transferred to Harrisburg. He will be succeeded in Lancaster by Mr. W. C. Fink, of Harrisburg, who has been connected with the telephone company for some years.

The general route and points to be connected by the newly-formed Co-operant Telephone Company of Dresden Station, N. Y., are as follows: Through Essex, Warren, Saratoga, Rensselaer and Albany Counties, connecting Port Henry, Crown Point, Ticonderoga, Putnam, Dresden, West Haven, Vt., Fair Haven, Vt, Whitehall, Granville, Fort Ann, Fort Edward, Sandy Hill, Glens Falls, Saratoga, Ballston, Mechanicsville, Waterford, Cohoes, Troy and Albany.

Next summer Aroostook County, Maine, will be connected with the outside world by a telephone line from Houlton to Bangor, by way of Island Falls, Patten and Mattawamkeag. Arrangements are being made for the poles to be delivered along the line, and work will begin in the early spring.

At a recent joint session of select and common councils, of McKeesport, Pa., ordinances were passed giving the Central District & Printing Telephone & Telegraph Company, the Federal Telephone Company and the Pittsburg & Allegheny Telephone Company rights of way to lay underground wires through the town.

The Home Telephone Company of Findlay, O., has begun work upon its system. The wires are to be placed underground, and the company expects to have 1,000 'phones in operation by February.

Several residents of Monticello, N. Y., have organized a new telephone company. Twenty shares of $100 were taken, at the first meeting. E. S. Rockafeller is the promoter.

The new telephone line between Groveton and Lancaster, N. H., is about completed.

TELEPHONE INCORPORATIONS.

The Advance Telephone Company, Advance, Ind. Capital stock, $2,000.

The Oakland County Telephone Company, Pontiac, Mich. Capital stock, $50,000.

The Montpelier Telephone Company, Indianapolis, Ind. Capital stock, $25,000.

The Bedford County Telephone Company, Bedford, Pa. Capital stock, $3,500.

The F. E. Bell Telephone Company, Des Plaines, Ill. Capital stock, $10,000. Incorporators: Frank E. Bell, Edward A. Manuel and William Nunn.

The Springville Telephone Company, Springville, N. Y.—Capital stock, $3,000. Directors: M. N. Brooksell, F. D. Smith and A. A. Churchill, of Springville.

The Corning Telephone Company, Corning, N. Y. Capital stock, $1,000. Directors: B. F. Hubbell, C. B. Stowe of Cleveland and G. N. Orcutt of Hornellsville.

The Baldwin Telephone Company, Baldwin, Wis. Officers: President, Dr. George Martin; vice-president, George Pittman; secretary, C. N. Gorham; treasurer, Frank Settergren.

The Bluffton Telephone Company, Bluffton, O.—to build and operate a telephone line. Capital stock, $13,000. Incorporators: A. A. Geiger, F. M. Haller, H. O. Bentley, J. S. Brailey and W. H. Harper, Jr.

The Greeley Independent Telephone Company, Greeley, Col. Capital stock, $15,000. Incorporators: A. W. Trenholm, Bruce F. Johnson, J. E. Neill, George J. Spear, and Fred E. Smith.

The Independent Telephone Company New Augusta, Ind. --to build and operate a telephone exchange. Capital stock, $10,000. Incorporators: M. J. Nagle, W. Johnson, W. B. McDonald, J. Harcourt, G. T. Avery, all of New Augusta.

The Lima Telephone Company, Lima, O.—to do a general telephone and telegraph business. Capital stock, $100,000. Incorporators: H. W. Neff, K. W. Hughes, M. O. Purtscher, W. M. Miller, C. F. Stolzenback; Cable & Parmenter, attorneys, all of Lima, O.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Baltimore, Md.—The electric lighting plant of the Glymont route steamer Estelle Randall is being overhauled. Parts of the machinery have been sent to this city for needed alterations.

Batavia, O—The electric light plant now in course of erection will be completed about September 10.

Billerica, Mass.—This town has voted to erect an electric light plant to cost about $25,000.

Boston, Mass.—Superintendent of Lamps William D. Laug will substitute electricity for gas on a number of streets in this city.

Brockville, Ont.—This city has voted to issue $100,000 in bonds to build an electric light plant.

Cayuga, Ont.—The dynamos of the Electric Light Company here were destroyed by fire last week.

Crawfordsville, Ind.—The city council has decided to make needful repairs and operate its own electric light plant.

Curwensville, Pa.—The Curwensville Electric Company is being organized with J. A. Frank, treasurer. This company proposes to enlarge the present plant and put in machinery.

Dayton, Ky.—The Dayton Electric Light & Power Company, recently incorporated, is advertising for bids for the erection of a new $25,000 plant.

Denver, Col.—The Colorado Springs Electric Company has authorized the announcement of a reduction in the cost of electric light to consumers from 20 cents to 12½ cents per kilowatt. The new rate becomes effective on December 1. General Manager Hine stated that the reduction was due to a new equipment for more economical production.

East Toronto. Ont.—The citizens of this place have voted to issue $7,500 in bonds to build an electric light plant.

Eldora, Ia.—There is a revival of electric light talk, and it now seems probable that a definite proposition will be placed before the town council and the people.

Englishtown, N J—The borough council has awarded a contract to the Freehold Lighting Company to light the streets of the town with electricity.

Grand Forks, N. D.—J. S. Bartholomew will rebuild his electric light plant that was recently destroyed by fire.

Houston, Tex.—A petition is being circulated calling upon the city council to build an electric light plant for which the people have already authorized the issuance of $100,000 in bonds.

Iola, Kan.—Bids will be received until September 11 for the erection of an electric light plant here. Address W. H. McClure, mayor.

Jefferson, Wis.—This city has purchased the electric light plant owned by a private company at a valuation of $25,000.

La Crosse, Wis.—The city council is seriously considering the proposition to purchase a municipal electric lighting plant.

Lafayette, Ind.—The prospects are decidedly encouraging that electric lights will be adopted.

Le Roy, Minn.—Dahler & Bosworth, owners of the electric light plant, have dissolved partnership. Mr. Bosworth will own and continue the electric light business.

Lincoln, Neb.—Sealed proposals will be received at the office of City Engineer Alna Dobson, for lighting the streets and alleys of this city in accordance with the specifications adopted by the city council.

Litchfield, Ill.—This city will build an electric light plant.

Marshalltown, Ia.—The Marshalltown Electric Light Company has brought suit in the Federal Court to restrain the city from enforcing the rates adopted by the city council.

Mayville, Mich.—The council will grant a franchise for a private electric light plant to take the place of the one recently destroyed by fire.

Montreal, Can.—The Hotel Dieu Hospital will be lighted by electricity. Mr. J. Valois, manager of the Chambly Electric Light Company, is putting up 1,500 lights in the institution.

Morrice, Mich.—Dutton & Mackey contemplate building an electric light plant.

Nachitoches, La—The contract has been awarded to O. Ford of St. Louis, Mo., for the erection of an electric light plant here.

Naugatuck, Conn.—This town is considering the question of erecting a municipal electric light plant.

New Castle, Col.—An electric light plant is being talked of and prospects are good for lighting this city by this means in the near future.

New Hartford, Conn.—At a recent town board meeting the Utica Electric Light & Power Company was given a franchise to light the business places and residences here.

Norfolk, Neb.—Norfolk's electric lighting plant will be improved $8,000 worth.

North Platte, Neb.—This place is to have an electric light plant.

Northville, Mich.—The taxpayers of this place are agitating the question of selling the city electric light plant to some responsible company and using the proceeds for bonuses for new factories.

Potsdam, N. Y.—A movement is underway for the organization of a stock company for the purpose of utilizing the latent water power at this village for the generating of electricity to light the streets, business houses and residences of the town. The establishment of a new plant seems to be but a matter of a short time.

Royer's Ford, Pa.—It was decided at a recent council meeting to dispense with the present system of lighting the streets and return to the method that prevailed prior to 1899—that of electric lighting.

Sellwood, Ore.—The Sellwood volunteer fire company is making an effort to get electric lights placed in the fire hall here so that the dangerous lamps used may be done away with.

Shelbyville, Ill.—H. B. Trout was lately granted a franchise to erect an electric light plant here.

Shippensburg, Pa.—John Hosfeld has recently been awarded the electric light contract for this place, and will erect a plant to run by water power.

Shortsville, N. Y.—The electric light contract has been signed by President J.M. Stoddard, so the citizens expect the streets to be lighted in the near future.

Statesville, N. C.—The Statesville Electric Light Company will install additional machinery for enlarging its plant.

Stephen, Minn.—An electric light plant is to be installed here. J. A. Larson, village clerk.

Thorntown, Ind.—This city is to have an electric light plant on the franchise or rented plan.

Virginia City, Mont.—This city is going to have electric lights. The Madison County Power Company, which is putting in a 1,600 horse power plant in the Madison canyon, will deliver the power in the mining camp.

Washington, D. C.—The superintendent of the Chilocca Oklahoma Indian School has been authorized to employ a competent electrical engineer to draw up plans for a new lighting system for the school, which is to be installed at a cost of about $3,000.

Waterbury, Conn.—The Scoville Manufacturing Company of this city is building an electric light plant near the canal for the use of its factory.

West Plains, Mo—It has been decided to issue $27 500 in bonds for the purpose of building an electric light plant and waterworks.

Winchester, Ind.—James W. Stephens of Rossville, Ill., has purchased the Citizens' Electric Light plant in this city.

STREET RAILWAYS.

Charleston, W. Va.—The Fairmont & Clarksburg Electric Company was lately incorporated here by J. N. Camden of Parkersburg and others for the purpose of building an electric railway from Clarksburg to Fairmont. The capital stock is $100,000.

Cheyenne, Wyo.—An electric street railway may soon be operated in this city. A number of prominent Cheyenne business men are working on the scheme and have interested capitalists from the East.

Cleveland, O—Geo. Mulhern, superintendent of the Little Consolidated, said lately, that early next fall his company expects to convert the Payne Avenue cable line into an electric road.

Elizabeth, N. J.—It is said here that the terms of the merger of the trolley interests of John Kean with those of the Hine-Riker syndicate have been settled, and that the consolidation will take place on December 1. Between now and then Mr. Kean will complete his line as far as Cranford. After the merger is effected the syndicate will extend the line to Cranford, out to Springfield, and thence westward into Morris County.

Georgetown, D. C.—It is understood a number of capitalists, including some men from here, are interested in the construction of a new electric railroad in Virginia, which will run to Great Falls.

Lansing, Mich.—Work on the new Lansing, St. Johns & St. Louis Electric Railway has been commenced.

Marysville, O—Dr. Kochendofer of Galion is looking up the prospects for an electric railway from this place to Richwood by way of Magnetic Springs.

Mt. Clemens, Mich.—G. R. Lovejoy, county treasurer, is interested in the proposed electric railway from Lenox to Sanilac Center. It will be 44 miles long and touch Memphis, Emmet, Brockway, Yale and Peck connecting at different points with the Grand Trunk, Michigan Central and Pere Marquette.

Oklahoma City, Okla.—A franchise has been granted by the city council to the Oklahoma City Land & Electric Railway Company for the construction of its line in this city, which will be built at once. Geo. C. Kelley, general manager.

Oley, Pa—At a recent meeting of farmers of the Oley Valley, the project of building an electric railroad through the valley, from Reading to Boyertown, was unanimously indorsed.

Platte City, Mo.—P. A. Gibson, of Kansas City, and others are here as projectors of the new electric line from Kansas City to St. Joseph via Parkville, this city and Dearborn. The capital is ready to put in the line as soon as the right of way is secured.

Providence, R I.—The promoters of the proposed trolley line to Fall River via Seekonk and Swansea expect to enter into direct competition with the steam railroad, it being their intention to make the run from the center of this city to the Fall River City Hall and return in one and a half hours.

Rockville, Md.—The taxpayers of this place recently voted to grant a franchise through Rockville to the Courthouse to the Washington & Rockville Electric Railway Company.

Selma, Ala.—The question of adopting electric motive power on the street car system in this city to take the place of the present mule power is being considered.

Trenton, N. J.—A syndicate headed by the Williamson heirs, of this city, and several New York and Philadelphia capitalists, has succeeded in securing franchises that will permit of the construction of a complete trolley road from Harrisburg, Pa., to New York.

MANUFACTURING.

Denver, Col.—A new industry for the manufacture of electric drills for mining operations is about to be started here. Negotiations are now pending for a site for the enterprise, which will have its machinery installed to turn out the finished product within the next ninety days. John McDonough is in the East buying the machinery, having $100,000 set apart for this purpose by the new corporation, which is known as the New Era Electric Company.

Dunmore, Pa.—The Dunmore Steel & Iron Company recently decided to equip its plant with electricity and placed an order with the Sprague Electric Company in New York for two split pole generators and 50 motors. The generators are 62½ and 100 kilowatts and the motors range from 3 to 20 horse power.

COMPANY MATTERS.

Bay City, Mich.—The Lowell-Muncey Electric Company recently changed its name to the Muncey-McLaughlin Electric Company, and will do all kinds of electrical construction, electrical and mechanical engineering and repair work.

Chicago, Ill.—The Western Electric Company has purchased all of the extensive dock property at the river and West Polk street formerly occupied by the Young & Farrell Diamond Stone Sawing Company. The purchase represents an outlay of $617 500 and an expenditure of $1,000,000 in improvements is predicted.

Dubuque, Ia—A deal was closed recently for the consolidation of the street railway and electric light plants of this city. The new company will have a capital stock of $1,000,000 and a charter for fifty years. The officers are: F. D Stout, president; W. S Molo, vice president; E. A. Engler, secretary, and George Kiezel, treasurer. Improvements to the extent of $100,000 will be made.

POWER AND TRANSMISSION PLANTS.

Manchester, Va.—The Virginia Electrical Railway & Development Company has contracted with the Richmond Electrical Company of this city to furnish the power necessary to run the latter plant when it shall have been completed.

Ohiopyle, Pa.—Ohiopyle Falls will be harnessed for power to generate electricity for the operation of a trolley system.

Portland, Ore.—Mr. Hurlburt has recently made surveys in the vicinity of Hurlburt and Gordon Creeks, where the water fall has been carefully measured and the volume of water estimated. It would turn a number of turbine wheels, and might be useful in the establishment of an electric plant to compete with the one that supplies this city.

Toccoa, Ga.—The Toccoa Falls Light & Power Company has lately been incorporated to develop water and electric power with a capital stock of $50,000. Among those interested are E. P. Simpson, S. V. Davenport and L. A. Simpson.

MINES.

Colorado Springs, Col.—Arrangements are being made by the Pike's Peak Coal Company to operate the Carlton coal mines north of this city by electricity.

AUTOMOBILES.

Chicago, Ill.—Articles of incorporation and charter of the Woods-Morton Cab Company have recently been filed. The incorporators are Harry Goodman, C. F. B. Goodspeed and Arthur B. Schaffner. The object is to let, hire, manufacture and sell cabs and automobiles. The company has a capital of $500,000.

Muncie, Ind.—Three automobiles are being constructed at the present time in this city. Mr. Cary Crozier is constructing one for private use, and W. F. Warner, superintendent of the Muncie Electric Lighting Company, also has one under construction. Walter Carpenter is building the third. The machines will all be operated by electricity.

New York City.—The General Automobile Company was recently formed here with a capital of $125,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Authorz'd	Issued.			
Albany, N. Y.—Aug 27.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000,000	1¼ % Q.,	128	124
Allentown Pa.—Aug 2:						
Allentown & Lehigh Val. Trac. Co.		4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Aug 27:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Aug 27:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—Aug 27:						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	8½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	144½	145
Brooklyn N. Y.—Aug 27:						
Brooklyn City Ry.	100	2,000,000	1,928,400	....	282	234
Brooklyn Rap. Transit Co., tr certif..	100	48,000,000	48,000,000	....	54	56¼
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.	100	2,000,000	1,884.200	2½ % Nov., '99.	322	325
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co.	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. B. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Aug 27:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co.	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Aug 27:						
Columbus Street Railroad.	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Aug 27						
Charleston City Ry. Co.	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co.	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Aug 27						
Chicago City Ry. Co.	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	250	255
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	80	81
Met. West Side El., pfd	100	15,000,000	9,000,000	....	79	80
North Chicago Street RR.	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.............com	....	1,250,000	624,900	85 %	12½	13
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.—Aug 27:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—Aug 27.						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry.	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—Aug 27:						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry.	100	....	1,200,000	....	175	..
Rapid Railway Co.	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—Aug 27:						
City Railway Co...............com.	100	1,500,000	1,470,000	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	...	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref stock of U. R & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Authorz'd	Issued.			
Hartford Conn.—Aug 27:						
Hartford Street Ry. Co.	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Aug 27.						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207½	212
Hoboken, N. J.—Aug 27.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind—Aug 27.						
*Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Aug 27						
Pennsylvania Traction Co.	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry.	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Aug 27:						
Louisville Ry.................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry.................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Aug 27						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—Aug 27						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S., M. & N.	249	250
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¼ % S., J. & J. †	100¾	100½
Memphis Tenn.—Aug 27:						
Memphis Street Railway Co.	100	500,000	500,000	....	25	--
New Haven, Conn.—Aug 27:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	--
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.—Aug 27						
Canal & Claiborne RR. Co.	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	--
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Aug 27:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	155	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	120	185
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2½ % Q.,Feb.,1900.	158	153¼
e Bleecker St. & Fulton Fy.Ry.guar	100	900,000	900,000	¾ % A., July,	32	36
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen.Park,N.&E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR.guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR........ ..guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR.............guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¾
m 42d St.,Manhatv'le & St.Nich.Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Aug 27:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57½	59
North Jersey Railway Co.	100	6,000,000	6,000,000	....	23	24
United Elec. Co. of New Jersey..	100	504,000	504,000	11½ % A.	18	19½
Pittsburg, Pa.—Aug 27:						
Allegheny Traction Co.	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	28½	28⅝
Consolidated Traction Co.......pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co.	50	1,500,000	|900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000	|2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..............com.	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co..............pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. | Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass–Aug 27						
Union Street Railway Co	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass–Aug 27						
Northampton Street Rv	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.–Aug 27.						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.–Aug 27.						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.–Aug 27:						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.–Aug 27						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '19	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
a Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co.......... $12½ pd	50	30,000 000	29,980,450	....	86⅞	87
b Electric Traction Co	50	....	8,297,920	....	..	...
d Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
e Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
f Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
f Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
d Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
c People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
g Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
g Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
h People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
h People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
i Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	9 ¼	98½
j Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
j Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
j Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
j Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
j Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
j Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
j 17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
j Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
j Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
j West Philadelphia Pass. Rv	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.–Aug 27						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.–Aug 27						
j Reading Traction Co	..	1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26
k City Passenger Ry	50	850,000	850,000	Jan., '98.	138	...
l East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.–Aug 27						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan.,'99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	...	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	..	..
United Electric Ry.......com.	50	500,000	500,000	....	20	21
United Electric Ry.......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.–Aug.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa–Aug 27.						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.–Aug 27:						
Springfield Consolidated Ry	100	750,000	750,000	....	----	--
Springfield O.–Aug 27.						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.–Aug 27						
Springfield Street Ry	100	1,200,000	1,166,700	3 % A.	207	212
Toronto Canada.–Aug 27.						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ⸗	97½	97⅝
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.–Aug 27.						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.–Aug 27						
*Worcester Traction Co.......com.	100	3,000,000	3,000,000	....	30	31½
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.–Aug 27						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. ⸗ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866–7–8 p.a. $20,000 in 1899–1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.–Aug 27						
American Bell Tel Co	100	50,000,000	23,650,000	4½ % Q., Jan.	275	302
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	99
New England Telephone Co	..	10,394,600	10,304,600	$1.50 p. sh. Feb	123½	125
New York.–Aug 27						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¼ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,723,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	.
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79	79¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.–Aug 27:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	119	120½
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co	50	....	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....		..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.–Aug 27:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	.
General Electric Co. [new] "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	137½	138
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.–Aug 27						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co.......com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	138⅞	138
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa–Aug 27						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	800,000	800,000	Q	--	--
Philadelphia, Pa.–Aug 27						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	75	77
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	77	78
Northern Elec. Light & Power Co.	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.–Aug 27						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118¾	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	2% Q ‡	201	202
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	181	182¾
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 98.	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.–Aug 27:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.–Aug 27:						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co.........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.–Aug 27						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----		162
Welsbach Commercial Co.....com.	100	8,500,000	......	----	21½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	48	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.–Aug 27:						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.–Aug 27:						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	13	16
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	32	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	57	59
Johns-Pratt Co	100	......	......	----	105	109
*Pratt & Whitney Co..........com.	100	......	......	----	2	4
*Pratt & Whitney Co..........pfd	100	......	......	----	40	50
Stillwell-Bierce Co.........com.	--	......	....	----	--	50
Stillwell-Bierce Co.........pfd.	--	......	......	2 % Sept 1,'99.	70	65
Shultz Belting Co	100	500,000	......	....	80	90
St. Charles Car Co		......	......	----	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Aug 27, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*118½	119⅛
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*123	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Aug 27, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR..........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1908	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry......1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	..	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Aug 27, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	108⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Aug 27, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	118⅛	114½
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR............1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	‡$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave..........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98¼	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co......Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	1o8¼	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	....	110½	112½
Third Avenue RR.............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.........................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized.
$600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Aug 27, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry.............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry...........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry......................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry........Stk. trs. cert. g. 4s	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry.......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co.........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry................1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col tr. 4s.	29,785,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry.......1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry.............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Aug 27 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111⅛	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	...	......
Citizens' Traction Co..............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	...	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End..........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........5s.	500,000	500,000	1912	M. & S.	......	....

Providence R. I.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co......1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Aug 27, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101⅛	102⅛
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101⅛	102⅛
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109⅛
Comp. Hts. Un. De. & Mer. Ter..1st	1 000 000	000 000	191	J& J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation—Aug 27, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co.........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co.............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
§$200,000 in escrow to retire 1st & 2d mtg.
‖$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal.						
Date of Quotation—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000.000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105¼	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C.						
Date of Quotation—Aug 27, 1900						
Belt Ry. Co.........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..............................mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home, mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Aug 27, 1900.						
Bridgeport Traction Co.........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1981	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	8,000,000	1988	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	8,000,000	2,866,000	1982	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1938	J. & D.	115	115⅛
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1938	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119¼
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105¼	106
St. Paul City Ry.....................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$37,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$820,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass						
Date of Quotation—Aug 27 1900						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation—Aug 27, 1900						
Allegheny County Light Co........ ......6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Aug 27 1900)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn)........	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	......	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8 000,000	....	......	F. & A.	102¼	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	..	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Aug 27, 1900.					100¼	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Aug 27, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co.......................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

Stockholders of the Union Traction Company of Philadelphia will hold their annual meeting September 19

Advices from Rochester, N. Y., state that the Sodus Bay Railway, an electric line, was opened for business on the 22d inst.

Officials say that the Metropolitan Street Railway Company's annual report will probably not be issued before September 1.

The Philadelphia Glenside & Willow Grove Railway, capital $100,000, has been chartered to build a six mile trolley from Cheltenham to Abington.

Directors of the Scranton, Pa., Railway Company have declared a dividend of 1 per cent. on the stock, payable September 1, to holders of record August 28.

Rumor has it that the report of the Erie Telephone and Telegraph Company for the year ended June 30 will show an increase of 41 per cent. in net earnings.

Of the $1,000,000 new 5 per cent. bonds of the Union Traction Company of Indiana offered in Philadelphia all but about $80,000 have been placed with investors.

Advices from Elizabeth, N. J., state that a consolidation of the extensive trolley interests of Senator Kean with those of the Hine-Riker syndicate has been agreed upon.

The Street Railway & Illuminating Company of Boston has declared a dividend of $3 per share on its common stock, payable August 29. Books closed August 23 and reopen August 29 (to-day).

The Wisconsin Traction, Light, Heat, & Power Company has filed articles of incorporation with the register of deeds. The company is said to control every electric plant and system in the State.

The latest quotations for some of the new industrial stocks, not given elsewhere; are: Electric Boat, 13@16; New York Electric Vehicle Transportation, 7½@8, New England Transportation, 3¾@4; Gramophone, 35@40.

The Brooklyn Union Elevated Railroad has obtained a writ of certiorari from Justice Mattice, in the Supreme Court, to allow the reclamation of the old Brighton Beach, Railroad, which was sold for taxes in 1895. It is now owned by the Kings County Elevated Railroad Company.

The reorganization committee of the Toledo, St. Louis & Kansas City Railroad Company gives notice that the second installment of $5 per share on the preferred stock and $3 per share on the common must be paid to the Central Trust Company by September 5. Certificates must be presented for endorsement.

The receivership of the Duluth Street Railway Company of Duluth, Minn., has just been terminated by order of the district court and the receiver discharged, and the new company has recorded a first mortgage to the Central Trust Company of New York covering five per cent. bonds for $2 500,000 issued to take up outstanding indebtedness and extend the lines of the company.

The Brooklyn Heights Railroad Company reports for the quarter ending June 30 as follows: Gross, $3,091,073; operating expenses, $1,779,044; net, $1 312,029; other income, $85 357; total net, $1,397,386; charges, $1,132,82; balance, $264,494; operating cost 1900, 57 55 per cent of earnings (excluding all taxes). Operating cost 1899, 59 56 per cent of earnings (excluding all taxes).

Referring to the copper market the Boston "News Bureau" says: Transactions in copper are in fair volume, and market has a very firm appearance at 16⅝ cents for lake, and 16½ for electrolytic. Although the market does not appear liable to any sudden changes, the trend nevertheless has recently been in an upward direction, and it is not improbable that higher figures may be gradually realized.

A semi-annual dividend of 2½ per cent. has been declared by the Electric Association (Postal Telegraph Company employes). The association is lending money steadily at 6 per cent. interest and 20 cents monthly premiums on each $200 share. A good many of the old borrowers on bond and mortgage have taken advantage of a new section in the articles, which gives them the option of refunding their mortgages at 6 per cent. flat.

The Pittsburg Consolidated Traction showed a surplus over the preferred dividend for the four months ended July 31, 1900, of $35,423. As it takes $300,000 to pay 2 per cent. per annum on the $15,000,000 common stock, the proposition of the Union Traction Company, of Pittsburg, which is consolidating the traction systems of that city, seems inviting to Pittsburg Consolidated common stockholders. As is well known, the Union Company organizers have not hesitated to guarantee a sliding scale of dividends on Consolidated Traction Company common, beginning the first year at 2 per cent.

A director of the Electric Company of America says: "Net profits from our regular sources of income for the first six months of 1900 were considerably ahead of the first half of 1899. We had the benefit, however, in that time, of the earnings of two Long Island properties which we do not now own. The proceeds from their sale have not been invested. We are looking at two or three properties, but are not in a special hurry to invest the money. We are getting 2 per cent. on it as a bank deposit. When we buy a property, we want to see 10 per cent. earned on it under its own operation. If it can earn 10 per cent. under its management, it can usually be made to earn more under ours."

The Philadelphia "Stockholder" says: There is a large local interest in securities of the Union Traction Company, of Chicago, and those who are chiefly concerned say that the stock is on its way to higher prices. The claim is made that the company's position is all right. Of course, there is keen competition by the Northwestern Elevated, but confidence is expressed that all the traffic diverted from the Union Company will shortly be regained. Officials report that for the present month thus far earnings have shown considerable improvement. The West Side lines have made big gains, and as nearly as can be ascertained the decrease in earnings of the North Side line (the one affected by the Northwestern's competition) has been greatly lessened. The system's suburban lines are said to be doing a splendid business.

An official of the American Telephone and Telegraph Company gives out correct figures regarding the capitalization and bonded debt of the American Telephone & Telegraph Company (Long Distance), from which it may be inferred that the $32,000,000 Long Distance stock in the American Bell Company's treasury will be divided among the Bell shareholders, making the third share as was expected in the change of Bell stock for Long Distance, or the entire amount of stock will be returned to the Long Distance Company's treasury. The situation is practically as follows: The total American Telephone & Telegraph Company capital issued and subscribed for is distributed as follows: American Bell stockholders, $52 000,000; In the Bell treasury representing original investment of Bell in Long Distance Company, $32 000,000; August 15 payment of subscription, $5,000,000; payment January 15, $5,000,000; total, $94 000,000. It is the $32,000,000 represented by the original investment in the Long Distance Company by the Bell that will be divided or returned to the Long Distance treasury. If returned to the Long Distance treasury, the outstanding capital January 15 would be $62,000,000. Bonds issued, $6,000,000; sold recently, $4,000,000; option given on, $5,000,000; total, $15,000,000. All bonds are 4 per cent, secured by collateral. Stocks of the subsidiary companies are owned by the Bell.

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EDITORIAL NOTES.

Electrical Undertakings in Russia.

Russia during the past year has been arranging to expend large sums of money in perfecting its electrical systems or in starting up new undertakings. One of the enterprises about to be embarked in consists in utilizing the falls in the River Dnieper for the production of electrical power. The plans have been worked out by a corps of Russian army engineers, and with these a company has been formed, which has set apart $3,000,000 for the purpose of carrying them out as soon as the concession is granted by the Government. The company proposes to make the Dnieper navigable from Ekaterinoslay to Alexandrovsk and transfer the power from the falls to the former city, where, of late, numerous factories, mills and mines have been opened.

At Vladivostock a new electric railway and electric light system are about to be established, while in Moscow and St. Petersburg steps have been taken looking to the establishment of various American manufacturing plants to cost in the neighborhood of $6,000,000.

Referring some time ago to the use of American made machinery in Russia, Mr. Thomas Smith, Consul of the United States at Moscow, said:

"American machinery will drive out English and German machines within the next ten years. When American machinery began to invade Russia, the employers and the operatives were doubtful about its lasting quality. They had become accustomed to the clumsier and heavier machinery supplied by Great Britain, and they feared that the lighter machines from this country would break down and become worthless. They have discovered that the better grade of material used in the construction of the American machines insures their durability, while their lightness makes operation much easier and quicker. Shortly before coming away I visited a factory where English, German and American lathes are used side by side. There is intense rivalry on the part of the Russian workmen in this shop to get assigned to the Yankee machines. One manufacturer told me that he had four times cut down the wages of the men on the American machines, because they made so much more money than their associates. He had to make the cut in order to allay the discontent on the part of the men running the older German and English machines."

But Russia is not alone interested in the development of its water power, the lighting of its cities by electricity and the adoption of up-to-date machinery in its factories. Attention is also being paid to its telephone systems, the latest advices stating that on November 1, 1901, the systems in St. Petersburg, Moscow, Warsaw, Odessa and Riga will be transferred from the hands of the Bell Company into that of the Russian State whence they will be re-transferred to private parties or companies. In this connection it is worthy of note that all foreigners may compete and obtain the concessions. We think it scarcely likely, however, that capitalists on this side of the Atlantic will care to invest in telephone undertakings in Russia, when there are so much more promising telephone fields nearer at hand, but it is nevertheless interesting to know that the Russian Government has made the competition an international one.

* * *

Two Electrical Surprises.

An important electrical decision was rendered last week by a United States Court Judge in favor of Mr. Nikola Tesla, and on the day following the rendering of the decision one of the New York daily papers announced in display type that Mr. Thomas A. Edison was almost ready to make public details of his newest startling invention.

Naturally two events of this nature created great interest in electrical circles, and it is with pleasure that we record the fact that Messrs. Tesla and Edison are receiving unstinted praise from the daily press.

The decision above referred to was rendered by Judge Townsend of the United States District Court at New Haven, Conn. It was a case which had in question the inventions of Nikola Tesla. It related to three inventions by Tesla—one of an electric magnetic motor, another on the electrical transmission of power, and the third for a specific construction of a motor embodying the invention of the other two patents. The main point is that by the Tesla invention there is not the waste of electric energy that there was under the old arrangement.

The defendants in the case were the New England Granite Company and others, and it was alleged that they had been using Tesla's

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inventions in mining and other operations. Judge Townsend upheld the plaintiff and, what is rare in a judicial opinion, paid a remarkable eulogy to Tesla. He said:

"A careful study of the evidence shows that Tesla has made a brilliant discovery. It remained to the genius of Tesla to capture the unruly, unrestrained and hitherto opposing elements in the field of nature and art and to harness them to draw the machines of man. It was he who first showed how to transform the toy of Arago into an engine of power; the laboratory experiment of Bailey into a practically successful motor; the indicator into a driver. He first conceived the idea that the very impediments of reversal in direction, the contradictions of alternatives might be transformed into power, producing rotations, a whirling field of force. What others looked upon as only invincible barriers, impassable currents and contradictory forces, he seized and by harmonizing their directions utilized in practical motors in distant cities the power of Niagara.

"A decree may be entered for an injunction and an accounting as to all the claims in suit."

The opinion described the elements involved in the case.

It is needless to say that Mr. Tesla was delighted to have recognition of the practical usefulness of his machines from a Judge who had gone out of his way to express his sense of the value of the Tesla electrical inventions. Mr. Tesla said that however much his inventions may have been utilized in the Niagara and other plants on the coast and in the Western mining camps, the credit of the details belonged not to him but to the engineers who had applied the Tesla system to the particular problems that were to be solved.

The decision sets a new standard for electrical patentees and protects the inventor from the use of his discoveries by any other than the company owning his inventions. The case will undoubtedly go to the Supreme Court, as the contentions involved are of unusual importance.

Regarding Mr. Edison's latest invention, we publish the article referred to on another page of this issue of ELECTRICITY. Of course it may prove to be a Kansas cyclone—nothing but wind—still we owe it to our readers to keep them posted on Mr. Edison's latest movements, and we will wait with great anxiety until September 15, the date set by the "promoters of the scheme to announce the new invention."

* * *

American Coal for Foreign Consumption. According to Mr. C. J. Wittenberg, president of the Chesapeake & Ohio Coal and Coke Company, who recently returned to this country from abroad, there is an excellent opportunity, if only taken advantage of, for dealers in this country to gain a prominent foothold in the coal markets of the various countries on the continent of Europe. As was stated some time ago in these columns, many of the electric lighting and manufacturing plants, more especially in Russia and Germany, were a few months ago almost destitute of fuel, owing to the inability of obtaining sufficient coal from Great Britain, with the result that many factory and other kindred industry owners are said to be looking into the feasibility of obtaining fuel from the United States.

The gentleman quoted above referring to this subject says:

"In 1899, England's shipments of coal to countries which we can reach exceeded thirty million tons. Up to ten years ago she had about all the West Indian and South American coal trade, most of which we have taken from her. We can now get our share of the world's trade, if we can get the ships. But the coal men of the country need to be aroused on the matter.

"While I was abroad I noticed a remarkable inquiry for American coal. The number of the people who called upon me in Paris to obtain data on the subject was astonishing. And in Denmark there was a special interest in the matter taken by the big gas concerns. The American coal exhibits at the Paris Exposition are attracting a great deal of interest, but they are so poorly accommodated, in out of the way quarters, that they are not shown to best advantage.

"Inquiries are being made for American coal by both the French and the Italian Governments for their respective navies. About July 1 there was a bill introduced in the British Parliament to prohibit the exportation of smokeless coal from Great Britain. It was argued that smokeless coal was like smokeless powder, and should be regarded as too precious to sell to other nations. No decisive action has been taken on this bill, but the French Government, in alarm, at once placed large orders for smokeless coal in England. Still fearing that it may never be able to have them filled, it is now on the lookout to get its coal from America, if need be.

"The principal points to which it would now be advatageous to us to ship coal would be on the Mediterranean, of course, because the low freight rates from England to other European centers make it hard for us to compete with Great Britain. As far as quality goes, the best American coal can about equal the coal from Cardiff, Wales, which is the best in Great Britain. Our coal is not so lumpy as the Cardiff coal, but that is really nothing in favor of the British product, though there is a prejudice for lumpiness in Europe. The British coal costs $7.50 at Cardiff, and can be delivered at $10 a ton on the Mediterranean. Ours costs $2.50 at Newport News, and can be delivered at about $7.60 on the Mediterranean. But we are sending very little thither, because we cannot get the ships."

After stating that most of the interests in England owning coal-carrying vessels are also interested in the British mines, Mr. Wittenberg adds that "if we could only have a subsidy measure passed which would encourage the building of American ships we could quickly build up a coal-carrying trade. We could build fully as good ships as they have abroad. I think even with the vessels diverted to transport service back at our disposal that coal freights to the Mediterranean would come down from $5 to $4 or $3.50 a ton, and enable us to undersell the British in Italy from $3.50 to $4 a ton."

In this connection it is interesting to note that the aggregate exports of coal from the United Kingdom for the six months ending June 30, this year, were 22,063,206 tons as compared with 20,990,630 tons in the corresponding period of 1899. Of this amount 4,230,783 tons went to France, 2,704,757 tons to Germany, 2,625,913 tons to Italy, the remainder being distributed between Russia, Sweden, Norway, Denmark, Holland, Spain, Portugal and other minor countries.

These figures will give our coal dealers some idea of the strong hold England has on the coal markets of the world, but in spite of this fact if sufficient interest is aroused, there would seem to be no valid reason why American coal should not ultimately be burned to run lighting, street railway and manufacturing plants in many European countries.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

INVITATIONS are out for the 22d annual Rhode Island clam dinner tendered to the electrical fraternity by Mr. Eugene F. Phillips, general manager of the American Electrical Works of Providence, R. I., at Pomham Club on September 13.

EXPORTS of American tools and machinery do not show the shrinkage in volume which recent reports would indicate. In exports of sewing machines, typewriters, electrical and other intricate machinery there are gratifying increases. Comparing the export figures of the fiscal year just ended with those of 1898 and 1899, it was found that electrical machinery increased from $2,052,564 in 1898, and $2,736,110 in 1899 to $4,328,917 in 1900.

WORKS for the generation of electric currents for various purposes are to be erected by Messrs. B. Egger & Co., of Vienna, Austria, in Thurmitz, North Bohemia. Water power will be utilized. Considerable machinery and supplies will be required for the undertaking.

THE Niagara Preserving Company at Lockport, N. Y., recently began to operate the machinery of its large plant by electric power received from Niagara Falls. The concern claims to be the only preserving plant in the world which operates by electricity.

COMPARATIVE tests were begun recently by the Equipment Department, upon a submarine electric light, used by divers. A diver of the Construction Department was sent down near the sea wall at the Navy Yard, in Brooklyn, near the launching ways. He used both the submarine light now in use by the Navy and the other which the Naval Electric Company of New York submitted for test. The test was ordered by the Bureau of Equipment at Washington and all reports will be forwarded there.

CONGRATULATORY messages from President McKinley and the German Emperor were flashed, on August 30, across the new German cable, to be operated in conjunction with the Commercial Cable Company's system from New York to Fayal and thence to Emden, Germany. This was the opening of the first direct telegraphic communication between the United States and Germany. This new submarine cable starts at Emden, Germany, touches at Fayal, in the Azores, and ends at Coney Island. The cost is placed at about $5,000,000. The stretch of cable between the Azores and Coney Island is about 2,279 miles long. The headquarters of the German branch of the new cable is at Cologne. Authorization to begin the work was given in April, 1899, by President McKinley, and shortly afterward by the German Emperor.

THE following extract from a sermon on "Burden Bearing," delivered by the Rev. W.

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Muzzel at St. Paul's, Withington, England, will be of interest to our gas friends. In this sermon the rector said that "nature was often made to share our burdens, and he wished the people of that church would assist nature by illuminating the place with the electric light, so that their lives might be spared for a few years, as God intended them to be spared, instead of running the risk of being poisoned by having to breathe (especially in the warm weather) the vitiated and poisonous atmosphere caused by bad gas."

Gen. Buller, the British commander, is said to be a good electrical engineer.

Judge Dissette, of Cleveland, O., has granted an injunction in favor of a young lady restraining a young man from making love to her or even calling her up by telephone.

The Union Traction Company of Philadelphia is experimenting with a new arrangement consisting of an application of ball-bearing axles. To use the contrivance, it is said, it is not necessary to have a specially built car, as it can be applied to any axle. The idea is still in its infancy, and although the Traction Company is making comparative estimates for the use of electric motors on the new and several of the old cars, no data are as yet prepared.

A good instance of the enormous growth and importance of the electro-chemical industry in the United States is afforded by the huge power plant of the St. Lawrence Power Company at Messena Springs, N. Y. This installation will take advantage of an extremely curious configuration of the country, whereby the St. Lawrence River is nearly fifty feet higher than one of its tributaries, the Grass River, which is only three miles distant. A canal cut across this short stretch of country gives one of the best water powers in the world and no less than 150,000 horse-power, or three times that generated in the great plant at Niagara, will be produced. All of this gigantic power will be used on the spot in electrolytic processes for the manufacture of calcium carbide, bleaching powder, alkali, etc.

The long-distance telephone is proving a boon to the commission man at the stock yards and his shippers in the country. The latter depends for advice on the stock yarder' They wait his admonition to ship in their stock and hasten to profit by it. Formerly this information was transmitted by telegraph. The operator at the nearest railroad station sent the message out to the stock man, probably several miles away, consuming much valuable time. The long-distance 'phone is effecting a radical change, and will be as important as the daily rural mail route before long, and promises to fill a much more important sphere.

A recent issue of "Stahl und Eisen" contains an article in which the author, Dr. Frank, proposes to utilize the great peat beds of North Germany for the production of electricity on a large scale, says our London namesake. He estimates that a hectare of turf, 3 meters thick, gives 2,500 tons of dry turf, equivalent to 1,200 tons of coke, or in Enlish measure an acre of turf, 10 feet thick, gives 1,000 tons of dry turf, equivalent of 480 tons of coke. The mosses of the Evus Valley, which cover an area of 1,000 square miles, might furnish the equivalent of 300,000,000 tons of pit coal; that is to say, more than the total production of Germany for three years. The turf would be burnt at central stations of 10,000 horse-power capacity, consuming annually 200,000 tons of turf, the product of 200 acres of the beds. One application of the power produced would be to the service of the canal connecting Dortmund to the Evus, which will soon be finished; but the author thinks the most interesting will be the manufacture of acetylene, the materials for which can be obtained easily and cheaply in the neighborhood. With 10,000 horse-power a quantity of acetylene can be produced daily, equivalent for lighting purposes to 150,000 gallons of petroleum, or annually in value to 20,000 tons of foreign imported petroleum.

A new substitute for celluloid for engineering and other industrial purposes is described, says the London "Electrician," in a German paper. The name of this new substitute is "Marloid," and it seems that it is manufactured from untanned leather boiled in oil. The product is said to resemble celluloid in every respect.

The contract between the United States Government and the Third Avenue Railroad Company of New York for carrying the mails expired on September 1. Some weeks ago the Metropolitan Street Railway Company, which now owns the Third Avenue road, notified the Postoffice Department that it would not renew the contract. The Government has not as yet made any contract in place of the one that has expired, and until it can make other arrangements the Third Avenue road will continue to carry the mails. The Postmaster of New York has recommended to the department at Washington that a contract be made with the Manhattan Elevated Company.

Freight will be transported over the local lines of the Milwaukee (Wis.) Electric Railway & Light Company within a few years, probably two, if the company sees that the coast is clear. For such work it will be necessary to use specially constructed cars.

The recent experiment conducted at Hartford, Conn., with automobiles for the collection of mail carried on by the Electric Vehicle Company, for the purpose of ascertaining what the requirements of the mail service are, and therefore enabling them to produce a machine especially adapted to that purpose, has proven of considerable value to the postoffice officials and the company. Although it was not expected that the wagons used in this experiment would be adopted by the Government, they nevertheless served admirably and accomplished the purpose of the company, and have given very little trouble under the present system of operating. It is anticipated that it may only be a short time before automobiles will be regularly used for the collection of mail, as well as for many other similar purposes,

Dr. Heber Robarts is at the head of a syndicate of St. Louis capitalists which proposes to build an electrical sanitarium in that city. "The hospital will be as nearly a battery in every corner and crevice as we can make it," said Dr. Robarts. "It will be fitted with every kind and variety of electrical apparatus that has anything to do with the generation of currents. The expenditure of a large sum of money will be necessary to provide us with these appliances as all of them are of the most delicate order, but we will be able to command the funds needed. The hospital will be a thoroughly legitimate institution. It will not be operated on a cure-all basis. We will simply take patients and treat them, obtaining the best results we can. I will have a staff of assistants and they, like myself, will be regular practitioners of medicine, who have devoted special attention to electricity as a therapeutic agency. Our plan is to devote special consideration to chronic troubles that cannot be treated properly in the old way. There are also many diseases that the profession has until recently considered incurable. Among these are external cancers, lupus, chronic rheumatism and eczema. Late experiments have shown conclusively that these can be cured by the use of electricity. We have no intention of abandoning medicine. On the contrary, we shall use it with great freedom. We will not administer it, however, in the old way. We will diffuse it through the affected parts by the use of electric current over electrodes. This process is technically known as cataphoresis."

A curious telephone phenomenon has been reported to a Belgian scientific society by M. E. Piérard. He found that if a metallic diaphragm is vibrating under the action of the human voice, for example, and a platinum point touched a small platinum plate soldered to the middle of the diaphragm, the apparatus acted as a telephone transmitter, even if no battery were employed with it. By carefully eliminating all possibility of any action analogous to that of the string telephone, and by introducing an induction coil between the transmitter and receiver, the action of the apparatus was clearly shown to be electrical. The only source of electricity possible in such an apparatus was the contact of dissimilar metals at the point where the platinum disk was soldered to the back of the diaphragm. Careful investigation showed that this explanation solved the mystery. The discovery is of no practical value, except as another means of showing the exquisite sensitiveness of the telephone.

It has been decided by Director of Works Carlton that there will be no night work on the electric tower in course of construction at the Pan-American Exposition grounds at Buffalo, N. Y. The electric tower will be about the most brilliant feature of the Pan-American, and it is highly important that it be finished in time. The contractors are behind time in their work now, and every means is being resorted to to complete the steel structure. But the humanity of the director of works outweighs his ambition to have the tower done in time. After a thorough investigation into the question of working at night, Mr. Carlton came to the conclusion that it was an extremely dangerous thing to do, and so the plan was dropped. "It would mean death to some of the workmen, I am afraid, if we worked at night," said Mr. Carlton, recently. "The men who run about narrow timbers and ticklish perches hundreds of feet above the ground are apparently without fear of falling. But they are accustomed to having daylight in under them, and the most daring of them would suffer from a nervous dread at night. No matter how the lights were arranged shadows would be cast of the most deceptive nature and it is almost positive that accidents, which could only result in death, would happen."

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THE BOIS DE BOULOGNE COMBINED TROLLEY AND SURFACE CONTACT TRAMWAY.*

M. Vedovelli's system of electric traction with surface contacts has just been applied to the Bois de Boulogne Railway which extends from the Neuilly Gate to Saint Cloud, passing along the Bois de Boulogne, passing in succession through the Sablous Gate and the Madrid Gate, following the Seine for about 1,500 meters and crossing it at the Suresnes Bridge and arriving at the terminus at the summit of the Val d'Or. The traction is of a mixed character, the line being divided into nine sections worked alternately by the trolley system and by surface contacts. The contact system was ordered by the administration to be used at the gates and at all points where it was considered that the overhead line would detract from the beauty of the scenery of which Paris has every reason to be proud. Fig. 1 shows a view of the station at the Neuilly Gate; at the starting point the overhead wire is used.

Near the Hippodrome at Longchamps, before arriving at the Suresnes Bridge, a loop line has been made in order to allow of a special service between the Suresnes Bridge and the Neuilly Gate.

It was necessary to arrange for this service for those days when, owing to attractions of the Hippodrome, the traffic will be considerably increased. It was really the importance of this traffic that decided the employment of the contact system and caused it to be chosen in preference to the other, without taking into account considerations of economy.

The line being divided into various sections, it was desired to avoid the stoppages and jerks that might occur in passing from one system to the other. With the contact system the change in the mode of working is effected at the normal speed. To do this the trolley line is continued for some meters over the contact line, so that for a few seconds the car is receiving the energy both through the wire and through the contact blocks. Moreover, in order to facilitate the resumption of the wire, a bow is used which is brought to rest automatically on the line at the moment it comes into action. Fig. 2 is a view of the surface contact line.

The Bridge of Suresnes is traversed by a single line worked by contacts. The plant was supplied by the Fives-Lille Company. It consists of two groups of generators, one of 400 kw. power, the other, which acts as a reserve, of 250 kw.

The steam engines are of the well-known horizontal Fives-Lille type with four distributors. The dynamos are over-compound 500-volt machines.

Two feeders start from the board, one supplying the up line, and the other the down line, and are branched into the section comprised between Longchamps and the Neuilly Gate.

This board is furnished with the ordinary measuring and safety apparatus, voltmeter, amperemeter, lightning conductor, and automatic circuit breakers.

The rolling stock consists of motor cars and trailers. The cars measure 9.40 meters between the buffers, and are mounted on two pairs of wheels. The distance between the axles is 4.80 meters. The curves of the track have at several points a very short radius (25 meters), and in order to round them the axles have had to be mounted on converging jointed trucks, which act very satisfactorily.

Fig. 3 shows a diagram of M. Vedovelli's system of line with surface contacts.

L is the line conveying the current, P_1, P_2, P_3, the contact studs over which the contact bar, B B^1, of the tramway passes in succession, and receives the current, which passes on to the electric motors, returning to the station by the rail.

The tramcar goes in the direction of the arrow F.

Referring to the contact bar at the moment it receives, normally, current from the stud P_1, as soon as the extremity, B, of the bar touches the stud, P_2, a derived current passes through a solenoid, S_2, of fine wire, and returns to earth, i.e., to the rail, by the two terminals, a_2, and b_2, connected on short circuit by a bridge-piece, K_2, which is movable round an axis of

FIG. 1.

rotation, O_2. The solenoid contains an armature of soft iron connected with the supporting lever of the bridge-piece, K_2, so that when the solenoid receives the current and attracts its armature, the bridge-piece, K_2, is raised vertically. It leaves the terminals, a_2 and b_2, on which it rested freely, and bears heavily on the terminals, c_2 and d_2, which it short circuits. Now the terminal, d_2, receives the current directly from the line, the stud, P_2, comes, therefore, into metallic connection with the main line, L. The stud, P_1, remains capable of feeding the contact bar of the tramway until the next stud, P_2, has in its turn been brought into metallic connection with the line, L. Now when the bar, still traveling in the direction of the arrow, F, has passed into the position shown by the dotted lines in the figure, the solenoid, S_3, following the mechanism explained above, will have attracted its armature, and the bridge-piece, K_3, having connected the terminals, c_3 d_3, will, on the contrary, have cut the circuit between the terminals, a_2 and b_2. The derived current passing through the solenoid, S_2, is therefore interrupted at these points. The armature, K_2, falls back upon the terminals, a_2 b_2, and the terminals, c_2 d_2, are disconnected. The stud, P_2, is thus also disconnected.

Thus by a very simple arrangement the introduction into the circuit of one stud shuts the preceding stud out of the circuit.

By virtue of a very ingenious device, the bridge-piece, K, only leaves the terminals, *a b*, after having connected the terminals, *c d*. It follows from this arrangement:—(1) That the main current is brought to the stud required by the contact bar, and that the closing of the studs, *c d*, does not serve to establish the main current; (2) that the terminals, *c d*, are disconnected when the stud about to be released is still in contact with the bar. These terminals, therefore, do not serve to break the current, which is always done in the contact bar.

It is, in fact, of the highest importance for the good working and the durability of the apparatus that the terminals, *c, d*, should be used, not as interrupters, which would be the seat of sparks and so be rendered liable to rapid burning up, but as commutators connecting or separating metallic terminals, brought to the same potential, no spark between them being then possible.

We have supposed the tramway to be working normally. At the commencement the first stud will evidently receive the current either from the trolley or from a stud charged by hand as the cars start from the works. The last stud of a section consists simply of a commutator of the ordinary type, of which the terminal, *d*, remains insulated and the solenoid is directly connected with the rail.

M. Vedovelli's tramway, like all others of the kind, is provided with a safety apparatus, in order to prevent a stud from being uncovered by the vehicle while it is still charged. This arrangement consists in this case of a pendant chain connected permanently with the earth and brushing in succession the studs released by the car. If by accident one of these studs remained charged, the chain by its contact would produce a short circuit on the line, and would bring about either the melting of the safety fuses placed in the corresponding distributor, or the release of the automatic circuit-breaker of the central station.

M. Vedovelli's system, by the very fact that the stud when charged effects by its introduction into the circuit the release of the preceding stud, gives the vehicle a well defined rate of proceeding. The mechanism which we have described for the successive excitation and release of the studs is not reversible.

In cases where the requirements of the road necessitate the establishment of a single line, and where consequently we are obliged to have vehicles traveling in both directions on the same line, a simple solution of the problem is to supply the track with a double series of distributors; some feeding the up line and some the down line.

In this case, in order to prevent the studs of the up line from being charged by the up cars, the extremities of the solenoids may be connected with a common earth wire which will be insulated from or brought into contact with the rail as required, by a single commutator worked automatically by the vehicle itself.

We may also remark that in order to reverse the action of the distributors, we have only to switch the connections to earth of the solenoids which are to be connected with the right hand commutator in the case where the direction in

*Paper read by M. X. Gosselin before the Societe Internationale des Electriciens and translated from the Journal of the Society by the London "Electrical Review."

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which the car is proceeding is the opposite one to that indicated by the arrow. This reversal of the connections may be effected by means of a simple two-way commutator placed in the distributor.

The contact studs are placed at intervals of 3 meters and the distributors, 10 in number, are placed in leaden boxes along the side of the

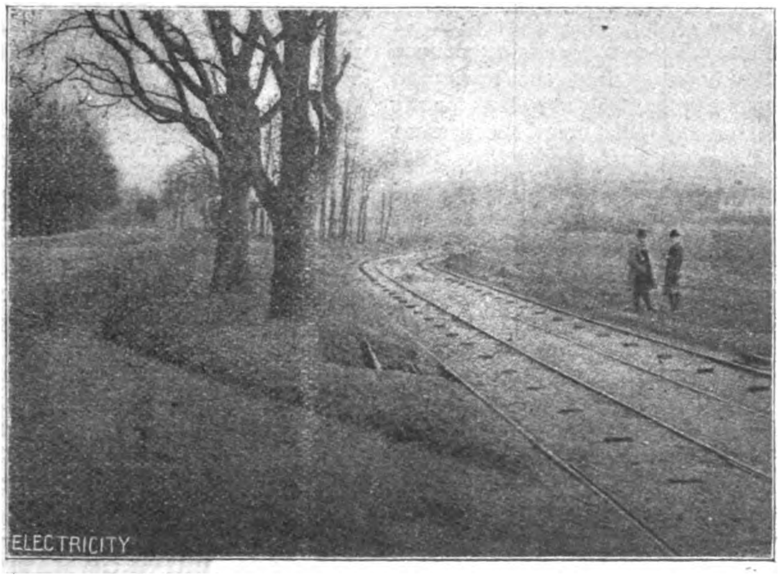

Fig. 2.

track. A single commutator then controls the whole of the corresponding section, and can be manipulated automatically by the passing of the train.

This subjection of the direction of the car to that of the action of the distributors occurs inevitably in all tramway systems worked by contacts in which the stud charged cuts off the current from the disconnected stud.

In certain instances this inconvenience becomes a real advantage, as the electric system of feeding constitutes in itself an inviolable automatic block system.

It will be noticed that the tram when in motion never covers more than two studs. The track therefore becomes free as soon as the vehicle has passed, and a second car can follow at an interval of a few meters.

This is an advantage over some systems in which the line has to be divided into sections which one car, and only one, must occupy at a time, or a stoppage will be occasioned in the normal distribution of the current.

One of the contingencies to be provided against in the stud system of tramways is the failure of the bar to make contact with a stud, either through the bad working of one of the distributors or through the accidental interposition of some insulating material, a piece of wood, sheet of paper, etc.

In the system we are describing, if the car fails to make contact with a stud, the preceding one is not disconnected, and the safety chains on touching it produce a short circuit which brings into action the fusible safety apparatus or automatic circuit breakers.

The current is thus broken on the disconnected stud. By hypothesis, it is not established on the next—the car stops.

It is, in my opinion, one of the great advantanges of the system never to allow the car to pass a stud that has not worked normally.

We can thus be absolutely sure that in the course of the working any defect produced will reveal itself at once, so that the remedy can be applied immediately. All tramway systems worked by contacts do not offer this security.

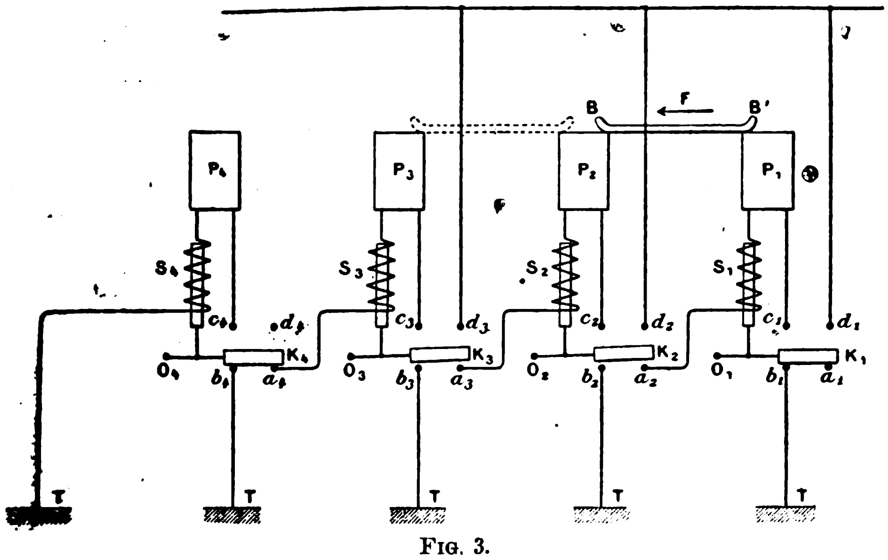

Fig. 3.

The utilization of the distributors as commutators and not as interrupters ensures, as we have already remarked, the suppression of arcs of establishment or breakage of current in the apparatus.

The result is great reliability of working as regards derivations of currents which might be produced on the line between the studs and the earth when the insulation of the contact is defective. We passed a car over some studs on which we had purposely established an artificial derivation, allowing about 80 amperes over the normal charge to pass. As the breakages of the arc took place on the contact bar, the distributing apparatus supported the overload very well.

In short, therefore, M. Vedovelli's tramway seems very interesting from the point of view of simplicity of mechanism and safety of working.

SOME NOTES ON DR. R. C. SHETTLE'S VIEW OF THE ULTIMATE NATURE OF ELECTRICITY.*

BY SPENCER L. FLETCHER.

The view taken by Dr. R. C. Shettle of the ultimate nature of electricity is briefly as follows: (1) that electricity is a substance which probably consists of ether in a state of condensation; (2) that the individual atoms of matter are surrounded with atmospheres of condensed ether, which give to them their electrical properties and power of chemical combination.

From this it would follow that a positively-charged body is one which is more densely charged with condensed ether than a neutral body, a discharge being merely the liberation of this condensed ether. The view that electrical phenomena are to be ascribed to the agency of a substance is by no means foreign or contrary to the electrical science of to-day. "Clerk Maxwell proposed a theory of the relation between electromagnet phenomena and the phenomena of light, based upon the assumption that each of these are due to certain modes of motion in the all-pervading ether of space, the phenomena of electric currents and magnets being due to streams and whirls and other bodily movements in the substance of the ether, while light is due to vibrations to and fro in it."†

In a recent text-book for the University of London, the following statements occur: "When we electrify a body we effect some change in a very imperfectly known substance called electricity, which is associated with all matter, and which can be transferred from one body to another. When bodies possess their normal amount of electricity they are neutral, and when they possess more or less than that amount the excess or deficiency is called a charge. . . . When two dissimilar bodies are rubbed together all that takes place is a transfer of electricity from one to the other, so that one acquires an excess, the other an equal deficit."‡

The view that the ether of space tends to condense upon the ultimate particles of ordinary matter is supported by no less an authority than Dr. Oliver Lodge.§ The velocity of light in glass, as proved by the experiments of Foucault, is about two-thirds of the velocity in air (186,000 miles per second). To what must this decrease in velocity be ascribed? Glass itself transmits vibrations at only a few thousand feet per second, hence we must ascribe the transmission of the light rays which traverse the glass, not to the material of the glass itself, but to the ether within it. We arrive at the conclusion that the ether which occu-

* From the "Electrical Engineer," London.
† Silvanus Thompson's "Lessons on Electricity and Magnetism," p. 359.
‡ "General Elementary Science," electrical section, pp. 89 and 90; John Don, M.A., B.Sc.
§ "Modern Views of Electricity"; Dr. Oliver Lodge.

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pies the interstices between the particles of the glass transmits light with only two-thirds of the velocity of light traveling in the ether of space.

From the analogy of sound, it is known that wave motion is retarded either by a decrease in the elasticity or by an increase in the density of the medium traversed. Dr. Lodge prefers the latter cause, ascribing the diminution in the velocity of light when traversing glass to a condensation of the ether within the substance of the glass itself. This means that each particle of the glass is surrounded by an atmosphere of ether which is of greater density than the ether of space. It appears that these ether atmospheres might be transferred from one particle to another according to much the same laws as those which govern the production of electric charges by friction. The source of electrification appears to be really contact of dissimilar substances, that is, substances which have a natural difference of potential, the motion of one substance over the other merely serving to renew the surfaces in contact.

By the natural potential of a substance is to be understood (according to the views stated at the head of this paper) the pressure of its contained ether. This will depend upon the tendency of the individual atoms of the substance to condense the ether of space around them, and this will presumably be different for the atoms of the different elements. Thus, if two *different* substances were brought into close contact so that their ethereal atmospheres might coalesce, it seems quite conceivable that after separation their charges of "bound ether" should be found to be shared in a proportion differing from that in which they existed before contact. One would lose exactly what the other gained, and thus positive and negative charges (representing excess and deficiency of electricity) would be produced in equal amounts. If the two substances were identical in every way, the affinities of their particles for ether would be equal, and there would be no tendency during contact for an *unequal* distribution of the ether charges. Hence, with two substances which are identically the same, no electrification results from bringing them into contact. This is exactly in accord with experiment.

If we conceive the ether atmospheres of the atoms to be endowed with any property resembling surface tension, it is possible to form a theory of chemical combination. For if two atoms were brought so near together that their ether atmospheres touched, these would coalesce like two drops of water, and since the ether atmospheres are attached to the atoms the two would be held togther. In cases where the atomic atmospheres were large, the interstices of a molecule formed of such atoms would be completely filled with condensed ether, and a superabundance would accumulate outside. Such a molecule, or a mass of such molecules, would, according to the above views, be positively electrified, i.e., in a condition to communicate electricity (condensed ether) to a neutral body. Should this be a metallic wire, the excess of ether of the positive body would coalesce with the ether envelopes of the atoms of the wire at the point of contact, and from these pass on to others, thus establishing an actual flow of condensed ether along the wire until its potential and that of the original body were equalized.

Conversely, the constitution of a negative body would be such that its atomic interspaces were only partially filled with condensed ether. The atoms would have small envelopes, which would coalesce only at the points of contact with one another, leaving interspaces between. (Note.—It would at first appear that a positive body which is completely saturated with condensed ether would necessarily lose its cohesive property, because when the atomic interspaces were full, there would be no "capillary" surfaces of condensed ether to exert tension between the atoms. The conception of ethereal atomic envelopes possessing surface tension implies, however, that the condensed ether has an affinity for itself as well as for the atoms of matter, and this, upon the present hypothesis, is the ultimate force which holds the particles of a mass together.) The layer of condensed ether upon the surfaces of the atoms cannot be infinitely thin, or the amount condensed within a mass of glass would not sufficiently fill the interspaces in which the light travels to seriously affect its velocity. And since refraction (which is due to the retardation of the ray on entering the denser medium) takes place even in the upper regions of the atmosphere, it appears that the ether envelopes must fill a portion of the atomic and molecular interspaces, which is by no means negligible even in a rarefied gas.

Let us trace upon these hypotheses the action of an electrolytic cell containing, say, a solution of sodium chloride (NaCl). In a dilute solution, the ions, Na and Cl, it is now believed, are traveling about separately in the liquid, the Na endowed with a positive, the Cl with a negative electric charge. In other words, the Na is associated with an excess, the Cl with a deficiency of condensed ether. The two electrodes are also positive and negative in the same way. When an atom of Na, with its excess of "bound ether," comes into contact with the negative electrode, there is a transference of ether from the Na to the electrode. When an atom of Cl which is negative or deficient in ether comes in contact with the positive electrode which contains an excess, there is a transference of ether from the electrode to the Cl. Thus electricity enters the liquid by the positive and leaves it by the negative electrode. The ions appear only in the near neighborhood of the electrodes, for until discharged by contact with them they appear to be chemically inert. The action of a voltaic or primary cell may be explained in a similar manner. When dry zinc and copper are brought together in air, the zinc is relatively positive, and electricity flows from zinc to copper. If, however, the zinc and copper are partially immersed in a dilute acid and contact is made, the zinc is relatively negative, and the current flows (above the liquid) from copper to zinc. It appears that of two metals dipped into a corrosive liquid, that one becomes negative which is more easily corroded. Let the exciting liquid be dilute H_2SO_4; of this, the H is positive, the SO_4 group negative (as proved by their going respectively to the negative and positive electrodes in electrolysis). The SO_4 combines with the zinc, forming zinc sulphate, which dissolves in the liquid; hence positive zinc atoms are continually being subtracted from the zinc plate. Meanwhile the positive hydrogen atoms discharge their excess of ether into the copper plate; and thus a current is kept up along the external circuit from copper to zinc. In the case of contact of the dry metals, ether is transferred from copper to zinc, because the atoms of the positive zinc have the larger ethereal envelopes, the inter-atomic interstices of the zinc are quite full, and an excess of condensed ether resides upon the surface of mass.

The ether envelope theory also explains to some extent why transparent solids are non-conductors and conducting solids are opaque to light. In metals the condensed ether, or at least a portion of it, appears to be capable of flowing from atom to atom within the mass of the substance, maintaining a uniform pressure throughout like a gas dissolved in a liquid. This would seem inconsistent with the rigidity necessary for the transmission of the transverse vibrations of light. In glass, on the other hand, the condensed ether appears to possess this rigidity, to be more rigidly attached to the atoms and less mobile. Hence glass does not conduct. Water, if quite pure, behaves like glass—transmits light, but not electricity. To render it a conductor, a catalytic agent must be present, as a few drops of acid. Even then the transfer of condensed ether through the liquid is only accomplished by means of actual movements of the atoms. It is not real conduction, but electrolytic convection. It thus appears that the condensed ether is an opaque conductor, such as copper, possesses a certain amount of mobility, while in a transparent insulator, such as glass, it is more rigid and resembles a jelly.

THE TEACHING OF MATHEMATICS.

In a recent number of "Nature," London, there appeared an excellent article by Prof. Perry on the above subject, of which the following is an abstract:

I think it very important to try to get a view of our system of teaching mathematics which is not too much tinted with the pleasant memories of one's youth. Like all the men who arrogate to themselves the right to preach on this subject, I was in my youth a keen geometrician, loving Euclid and abstract reasoning. But I have taught mathematics to the average boy at a public school, and this has enabled me to get a new view. I have seen faces bright outside my room become covered as with a thin film of dullness as they entered; I have known men, the best of their year in England in classics, lose in half an hour—as men did in the first day of slavery in old times —half their feeling of manhood; and I have known that, as an orthodox teacher of mathematics, I was really doing my best to destroy young souls. Happily, our English boys instinctively take to athletics as a remedy, and I know of nothing which gives greater proof of the inherent strength, in good instincts and common sense, of our race than this refusal to allow one's soul to be utterly destroyed.

I have also mixed much with engineers, who really need some mathematics in their daily work, men who say that they once were taught mathematics, and I know that these men never use anything more advanced than arithmetic, and actually loathe a mathematical expression when it intrudes itself into a paper read before an engineering society. Of all branches of engineering, electrical engineering relies most upon exact calculation. Well, the average electrical engineer in good practice would rather work a week at many separate arithmetical examples than try for an hour to get out the simple algebraic expression, which includes all his week's results and much more. Yet he has passed perhaps certain rather advanced examinations in mathematics. Furthermore, those engineers who can most readily apply mathematics to engineering problems

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almost invariably descend to the position of teachers and professors in schools and colleges, and they seem to lose touch completely with the actual life of their profession. I have studied these phenomena very carefully, and I affirm that they are directly traceable to the absurd thing called mathematical teaching in schools and colleges.

I do not mind retaining the buttons at the back of my coat; many useless ancient ceremonies may still be practiced, and I shall not object. I can even admire them, but the unscientific waste of the valuable youth of millions of our people, now that we are face to face with nations who evidently appear to be determined to destroy England through commerce and war, is so abhorrent to me that I cannot think of it with patience. It is not merely in arithmetic and geometry, but in the higher parts of mathematics that this waste goes on. Newton employed geometrical conics in his astronomical studies, and mechanics was developed; and therefore it is that every young engineer must study mechanics through astronomy, and he dare not think of the differential calculus till he has finished geometrical conics. The young applier of physics, the engineer, needs a teaching of mathematics, which will make his mathematical knowledge part of his mental machinery, which he shall use as readily and certainly as a bird uses its wings; and we teach him in such a way that he hates the sight of a mathematical symbol all his life after.

Great expectations are entertained and many plans are being formed in Porto Rico for the installation of short inland electric railways from the central range to the coast. The power is to be developed through the agency of many streams to be met with in every part of the mountain range which traverses the island from end to end. If all that is expected in the way of new roads and other electrical works is accomplished there will be a field in Porto Rico for considerable electrical machinery and material. The only road on the island, from the capital to Rio Padres, some nine miles in length, is shortly to be equipped electrically.

Success of the Electric Kitchen at the Paris Exposition.

The electric kitchen at the Paris Exposition seems to have settled all controversy regarding electricity as an economical and desirable method of cooking. The electric kitchen is probably the most elaborate affair of its kind ever installed. Between 300 and 400 guests are cared for daily, the cooking giving entire satisfaction. The mean consumption of electricity per guest amounts to about six cents, thus enabling the concessionaire to charge about the same amount for food as the average exposition restaurant price.

The electrically heated apparatus used is mixed with various proportions of non-conducting enamel, thus making blocks of high resistance material, well adopted to developing heat under the application of electric current. The restaurant kitchen is furnished with a great oven, four by seven feet, provided with eight heaters, which can be carried up to a temperature of 1,200 degrees centigrade. The heat not used for cooking is utilized to keep plates hot at odd times and for other purposes. There is also installed a roasting oven, which is capable of broiling meats with heat from red hot plates. Water boilers, soup kettles, etc., are installed, and smaller articles, such as coffee pots, tea pots, etc., are heated on small hot plates.

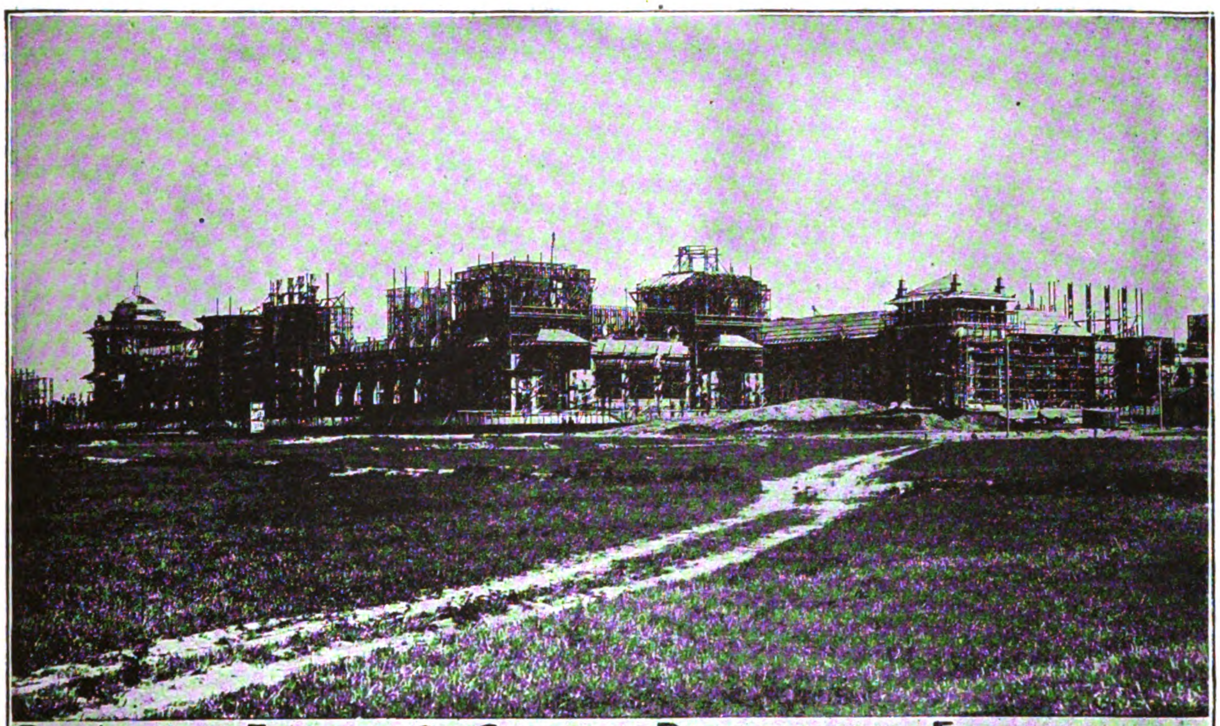
The main advantage of the electric kitchen is the rapidity with which food can be cooked, and the absence of smoke and all possible danger of fire. Now that electricity as a cooking force has been proved practicable, doubtless the electric kitchen will play an important part in saving the time and temper of those who wait on slow fires, and in promoting public health and happiness by insuring well cooked and easily digested food.

WORK ON THE PAN-AMERICAN EXPOSITION BUILDINGS.

The accompanying views give some idea of the progress of work upon the buildings for the Pan-American Exposition to be held in Buffalo next year. One of these shows the Electricity and Machinery buildings, looking southeast from that portion of the grounds which will be occupied by the Midway. The view does not clearly distinguish between the two buildings, but they are in reality separated by one of the main thoroughfares of the Exposition known as the Mall, 150 feet wide, which runs east and west. The other shows a nearer view of the Electricity Building looking up at the southeast corner. The point of view is near the base of the Electric Tower, the first lengths of the steel frame work of which are now being put in place and which will ultimately reach skyward 375 feet.

All of the large buildings of the Exposition are well under way. These include, besides those here represented, the Agriculture Building, Manufactures and Liberal Arts Building, Graphic Arts, Forestry and Mines, Horticulture, the large group of three Government Buildings, Temple of Music, Ethnology Building, Stadium, Midway entrances and concession buildings, New York State Building and the Albright Gallery of Art. The Service Building, which is the administrative headquarters of the Exposition, was completed early last fall.

By reference to the illustrations here given it will be seen that workmen are already putting on the gleaming white staff with which all the buildings are to be covered. The staff is prepared in an endless variety of forms, including elaborate statuary, large cartouches and medallions, rich columns, consoles and brackets, soffits and pilasters in relief, and all sorts of architectural ornaments of intricate detail. All the exteriors of the buildings are to be finished in color, presenting a most agreeable effect upon the eye. It is said of this Ex-



PAN-AMERICAN EXPOSITION Co. SHOWING PROGRESS ON ELECTRICITY AND MACHINERY AND TRANSPORTATION B'LDG'S

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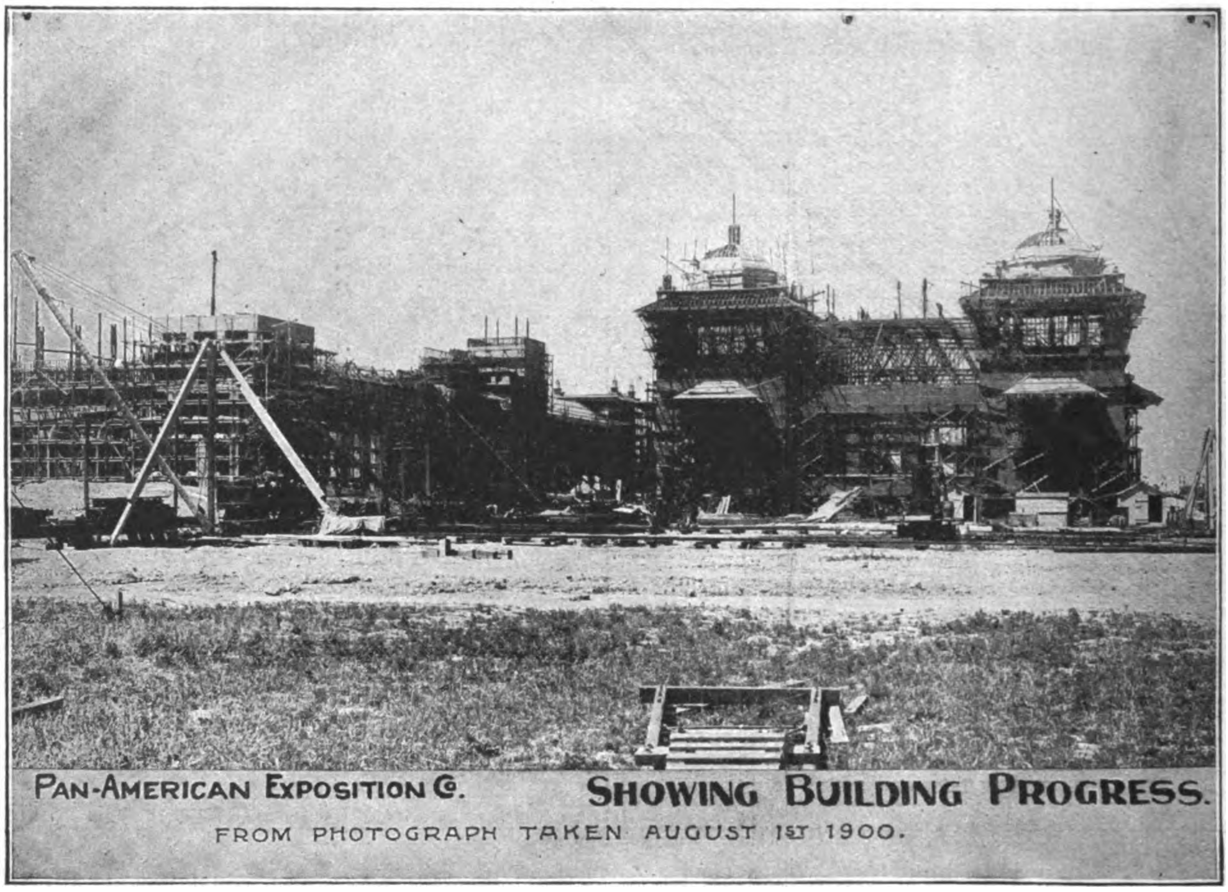
position that it will surpass all former expositions in the extent and variety of its sculpture and plastic decoration. It will also outrival its predecessors in the beauty and completeness of its horicultural and floral effects, and is to have the most elaborate and picturesque presentation of electrical effects ever undertaken. The arrangement of the buildings is a symmetrical one, nearly all of the principal structures being grouped about broad courts. About 33 acres of land are comprised in these courts, all of which will receive this elaborate embellishment. Large pools with a bewildering number of fountains and jets of water will complete the picture, and at night the rippling surfaces of water will be made particularly brilliant by means of floating lights and the wonderful illumination of all surrounding objects by the use of more than 200,000 electric lamps.

The installation of the heavier exhibits is to begin early in November, and the contracts require that all of the principal buildings shall be completed before severe weather sets in. Thus is the public assured that the Exposition will be opened on time and that the early comer will have quite as much to see as those who delay their visit.

The process of building a great Exposition has a charm to every one who has an interest in the development of any grand enterprise. It represents a vast organization, with its director-general and assistant directors, superintendents, contractors, care-takers, foremen and an army of workmen under the discipline necessary to carry on rapidly and successfully a great work. Materials are being brought into the grounds by train loads almost every day, and each week shows definite progress. The illustrations here given show what has been accomplished on the buildings in about three months. Another three months will find several of them completed and all of them so well progressed that the rigorous weather of winter cannot interfere with their prompt completion.



EDISON'S LATEST.

He Plans to Make Electricity from Coal and to Abolish Dynamos.

(From the New York Morning Journal, Aug. 31.)

Thomas A. Edison, the electrical wizard of the century, is reported to be almost ready to make public details of his newest invention. It is a machine for the generation of electrical power without the use of engines and dynamos.

This new invention is said to approximate almost exactly the production of electricity directly from coal. If the machine is a success its effect upon all methods of propulsion will be incalculable.

Edison himself said six years ago that such an invention would be the greatest possible step in the advancement of electricity. In an interview published October 28, 1894, he authorized this statement:

"The discovery of a way of converting coal directly into electricity will be the turning point of all our methods of propulsion. Steam will be entirely superseded by the current. There will be no boilers nor any of the necessary externals which go with steam engines.

"We are rapidly approaching the time of the steam engine's end. The large Atlantic liners are slowly reducing their time on their trips, but that must soon stop. Then we shall have to wait until coal is turned directly into electricity. I believe it will come, and then we will cross the Atlantic in four days or less. We can get 90 per cent of the efficiency of a dynamo, against 6 or 10 per cent. of an engine."

IT WAS EDISON'S DREAM.

This was Edison's dream in 1894. His vision seems to have become a reality.

William Phillips Hall, president of the Hall Signal Company and for years an experienced electrician, said yesterday:

"As I understand it, Edison's new scheme is the nearest approach yet to the generation of electricity directly from coal. The invention will be of vast importance to every field in which electricity is now used."

The new plan is expected to revolutionize the use of electricity in homes, in offices and in self-moving vehicles of all descriptions. It will make it possible for private electric lighting plants to be maintained in houses with but small expense. It will make it possible to store current in batteries of automobiles without the expensive necessity of carrying them to a city or electrical plant.

TO DO AWAY WITH DYNAMOS.

In the new arrangement a simple, portable and inexpensive machine, it is understood, will take the place of the commonly used dynamo. An oil stove is to supplant the steam engine. The exact construction of the new machine is still kept secret, but the principle of its operation was yesterday made known to the "Journal" by a man close to Edison and to whom had been explained the method of construction and operation of the invention.

The principle of the machine is the very simple one that cold contracts and heat expands any substance. In this machine a combination of metal—a combination the result of years of study and experimentation—is to be heated by a small stove.

The metals are said to be so arranged and combined that the heating of them starts in motion an electrical current which can be communicated immediately to a storage battery.

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STEAM A GREAT EXPENSE.

Ever since electricity began to be generally used the expense of purchase and operation of a steam engine and dynamo has barred it from the use of any one not possessing considerable money. To build an electric lighting plant in a small city has always been the origin of a burdensome debt.

The inconvenience of transporting storage batteries, sending them back and forth for charging, has practically deprived rural sections of the world of the use of electricity. Phonographs, automobiles, electric launches electric lighting plants, etc., could be used by only the wealthy.

Edison's new scheme is expected to revolutionize all of this. Where automobiles are now used by tens they will probably soon be used by hundreds, or even thousands. The phonograph industry will probably take a tremendous bound and elaborate electric illuminating plants can be maintained inexpensively in the remotest rural districts.

Although Edison has been at work upon his new invention at his Orange, N. J., laboratory, for nearly three years, every suspicion of his plans has been kept from the public. Only a very few were admitted into the secret, and they were pledged.

HIS PERPLEXING PROBLEM.

The problem that Edison had to face was this:

How can the greatest amount of electrical current be generated by the minimum amount of coal? How can the enormous heat lost in heating a steam boiler, the steam lost in moving the engine propeller and the power lost by friction of the engine and dynamo wheels, be conserved, and the current dispatched immediately into the storage battery?

No steam engine on land had ever been able to get more than one-horse power per hour for less than two-pounds and a half of coal, and by the time this power had reached the dynamo it was decreased, and still more so by the time the battery was reached.

Now that Edison is reported to have solved the question and is said to have made it all so simple that it seems like a sleight-of-hand trick laid bare, a company has been organized to put the machine on the market. This company has incorporated itself under the laws of New Jersey. This machine may prove to be practically useful in generating electricity upon a large scale.

In the one matter of storage batteries alone, the possibility of storing them directly from a machine with no dynamo will cause to jump upward an industry which has increased enormously within the last five years.

A Philadelphia concern, which has recently sent a statement to stockholders, sold $227,000 worth of batteries in 1895, $456,000 in 1896, $1,046,000 in 1898 and $3,500,000 in 1899, while during the first six months of the present year sales were greater than during the whole of last year. Edison's new invention, if practicable, will probably make the use of storage batteries almost universal.

It is understood to be the intention of the promoters of the scheme to announce the new invention about September 15.

"Pan-American Express"

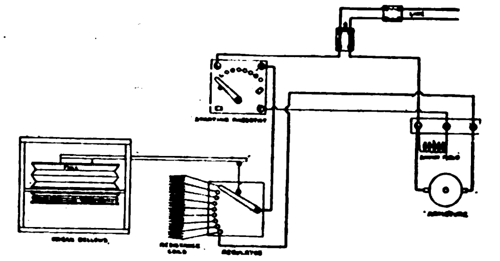
The "Pan-American Express" train of the New York Central was put in service in both directions between New York and Buffalo on Sunday, May 7, 1899, and was so named in honor of the great Pan-American Exposition to be held in Buffalo in 1901.

The main object of this train is to furnish the best possible night service between New York and Buffalo, Rochester, Syracuse, Niagara Falls and Toronto, the leaving time at either end of the line having been so arranged as to permit patrons to dine leisurely at home, or at their hotel, and have ample time to make the train and arrive in New York or Buffalo in time for breakfast at the usual hour and before the business of the day begins.

The equipment of the "Pan-American Express" train is composed of the most modern coaches and sleeping cars, built by the Pullman Company at their works in Buffalo especially for this service, and are of the strongest possible construction, combined with an ease of motion that makes the trip a positive pleasure to travelers.

Electrically Operated Church Organs.

The blowing apparatus of church organs when operated by a Lundell electric motor is regular and reliable in its service—two very important features required for organ music. It is exasperating to have the bellows suddenly give out or work with uneven pressure. With a Lundell motor outfit this does not happen, because the organ is under the absolute control of the organist. The motor is always ready for service, it never goes to sleep and does not require a vacation. The organist knowing the reliability of the instrument is



WIRING DIAGRAM FOR CHURCH ORGAN.

not nervous and can put more soul into his music; the church committee can be comfortable in the realization of its endeavors and the organ manufacturer knows to a certainty that mechanically the instrument will have the best opportunity to demonstrate its value.

The Lundell motor outfit is connected directly to the wheel, handle or shaft of the bellows, thus doing away with expensive and troublesome belting, shafting and all other cumbersome accessories which, of necessity, have heretofore been used in conjunction with electric, hydraulic and gas engine organ blowing outfits. Obviously there are no pipes to freeze, no smoke or odor, no increase or insurance risk, no noise and no continual repairs.

A turn of the switch puts the apparatus in motion, and an automatic regulator controls the speed in exact proportion to the amount of wind called for by the organist. Under average playing conditions the motor maintains almost a constant speed, keeping the bellows nearly full. When the entire resources of the organ are drawn upon, the motor quickly speeds up, giving the maximum supply of wind. If the player suddenly stops or plays pianissimo, the motor immediatly responds and its speed is decreased so that the bellows is not overblown. The outfit completely controls the wind supply under all conditions.

The starting switch can be placed wherever desired, usually where accessible to the organist. The motor is started or stopped with this switch and the regulator automatically takes care of the speed of the motor.

The regulator, should be placed so that the lever arm can be connected by cord or flexible wire to the lever or top of the bellows. The point at which this cord is attached should have the proper amount of movement between empty and full bellows, so that the controller arm will make its full movement during this period.

For small reed or pipe organs the outfit may be enclosed in a neat case and set at the side or back of the instrument. With large organs, the motor is placed wherever most convenient for connection to the direct acting bellows or the supplementary bellows.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Brandon Electric Light Company of Brandon, Manitoba, has been given authority to increase its capital from $50,000 to $125,000.

The city council of Kingston, Ont., will take steps to acquire the electric light plant of the Kingston Light, Heat & Power Company, or in the alternative to install a new electric light plant.

The town of Morrisburg, Ont., is inviting tenders for the erection of an electric lighting and power plant to include three distinct sections—hydraulic development and building, water wheels and steam works, and electric plant.

The question of municipal ownership of electric lights and street railways was a subject that received earnest consideration at the recent meeting of the Board of Trade for the Maritime Provinces of Canada. A resolution, to the effect that cities and towns should guard with great care their franchise for street lighting and railways, and retaining the same under control for cheaper consummation, thus averting the high charges of private corporations, was unanimously passed.

The Capital Power Company of Ottawa has been formed to take over and develop the Conroy electric plant at Deschenes Rapids, a few miles from Ottawa. This plant already brings in $33,000 yearly revenue and the expense of operating it is only $9,000 per annum at present. The company's new power house at Deschenes is furnished with modern turbines, made by the Triumph Manufacturing Company of Springfield, Ohio. The flumes are made of concrete and the buildings are fireproof, the whole being a good example of a modern, up-to-date power house.

While the development of water powers in electrical operations is one of the characteristic features of the day, the development of electrical energy on the Canad an side of Niagara Falls seems to be no further advanced than it was ten years ago. Whatever deals that the Ontario Government have lately made with electrical companies, they appear to have had the effect of only tying up the work of develment instead of promoting it. Last year the Government rescinded the monopoly of the United States Company, which heretofore held the franchise, and made provision whereby companies could obtain rights to develop electrical power at the Canadian falls. More than a year and a half have elapsed without any substantial progress being made, and there is little indication of development work being undertaken in the near future.

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AMERICAN STREET RAILWAY ASSOCIATION CONVENTION.

Secretary Penington desires ELECTRICITY to state that the nineteenth annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., October 16, 17, 18 and 19. Papers will be read on the following subjects:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidation of Street Railways and Its Effect Upon the Public."

"The Store Room and Store Room Accounts."

"Painting, Repainting and Maintenance of Car Bodies."

Friday, October 19, has been set apart as a day for the examination of the exhibits. No session of the Association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held at the Coates House Friday evening, when the officers-elect will be installed.

The headquarters of the Association will be at the Midland Hotel.

The following are the hotels and rates: Midland, American plan, $3 to $6 per day; European, $1 to $5; New Coates, American, $3 per day and up; European, $1; Savoy, American, $2.50 to $6 per day; European, $1.50 to $3.50; Baltimore, American, $3 to $5 per day; European, $1.50 to $3.

The executive committee advises all who desire rooms to apply at once.

The Passenger Associations have granted a rate of one and one-third fare, on the certificate plan, provided one hundred or more tickets are purchased. Be sure and get a certificate when you purchase your ticket and deposit the same with clerk upon your arrival at the hall. He will have it signed and ready to be returned to you on Thursday, October 18. You cannot get return ticket at reduced rate if you fail to get certificate when you purchase your ticket.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended September 1:

Alexandria, 3 cases, $150; Antwerp, 32 packages, $6,695; Argentine Republic, 76 cases, $1,813; Barcelona, 1 case, $46; Bath, 1 case, $110; Brazil, 48 packages, $3,140; Bremen, 1 case, $24; Bristol, 32 cases, $5,000; British East Indies, 19 cases, $894; British Possessions in Africa, 9 cases, $1,425; 107 packages, $13,101; British West Indies, 19 cases, $80; Central America, 84 cases, $1,417; Chili, 3 cases, $316; Cologne, 7 cases, $525; Cuba, 65 cases, $1,698; Ecuador, 2 cases, $26; Glasgow, 13,144 packages, $70,924; 6 packages motors, $200; 2 electric launches, $1,000; 56 reels electric cable, $19,951; Havre, 258 cases, $25,447; 1 box motors, $40; Hull 14 packages, $850; Japan, 9 cases, $737; Liverpool, 50 packages, $7,700; 80 cases, $6,354; 16 packages motors, $3,300; 2 packages electros, $166; 12 packages motor trucks, $1,386; 4 cases automobiles, $900; London, 301 cases, $11,608; 15 cases motors, $2,987; 1 case electros, $14; 4 cases motor cars, $250; Manchester, 56 packages, $7,685; Mexico, 136 packages, $7,912; 17 cases electric vehicles, $3,718; 36 cases electric motors, $6,216; Newcastle, 35 boxes, $4,700; Peru, 11 packages, $678; Porto Rico, 124 packages, $542; Preston, 24 packages motor trucks, $1,386; Reval, 39 cases electric motors, $6,993; Southampton, 37 packages, $3,333; St. Petersburg, 34 packages, $1,200; Trieste, 1 box, $51; U. S. Colombia, 20 cases, $490; Venezuela, 1 case, $12.

Estimate Wanted.

A storage battery to convey power for 24 hours and which can be easily recharged and give at least 25 pounds power; size to be 4 inches wide, 8 inches high and 4 inches deep; also a motor of light construction and not any wider than 2¼ inches. If any manufacturer has either the one or the other or both address with full particulars Arthur B. Jennings, care Oscar A. Michel, registered patent solicitor, Room 1204, No. 302 Broadway, New York City.

COMING ELECTRICAL EVENTS.

American Electro Therapeutic Association—Will meet in New York City Sept. 25-27, 1900.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

National Association of Municipal Electricians—Will meet in Pittsburg, Pa., Sept. 25-27, 1900.

Old-Time Telegraphers' Association and the U. S Military Telegraph Corps—Will meet in Minneapolis, Minn., Sept. 18, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

Street Railway Association of the State of New York—Will meet at Buffalo Sept. 18-19, 1900.

INCORPORATIONS.

The Covina Electric Company, Covina, Cal. Capital stock, $25,000. Incorporators: T. B. Thomas, H. M. Houser, O. Anderson and I. D. Houser.

The Barker-Moyer Company, New York City—to do electrical contracting. Capital stock, $10,000. Directors: W. A. Barker of Newark, N. J., C. O. Moyer and W. B. Dewey, Jr., of New York City.

The Manti Light & Power Company, Manti, Utah—to generate electricity and to operate dynamos for the purpose of propelling machinery and furnishing light and power to Manti and adjoining cities. Capital stock, $15,000. Officers: James Crawford, Jr., president; John H. Houggaard, vice-president; W. C. Snow, secretary and treasurer.

The Mountain State Electrical Company, Wheeling, W. Va. Capital stock, $50,000. Incorporators: Frank B. Hall, Harry F. B. McLain, John F. Trasher and Alfred D. Hall, of Wheeling, and Fred. B. Jones, of Martin's Ferry.

The United States Fender Company, Camden, N. J. Capital stock, $100,000. Incorporators: J Willard Morgan, William J. Browning and W. T. Weiss, all of Camden. Mr. Weiss is the master mechanic of the Camden & Suburban Railway Company and the inventor of the fender which is to be used on the Camden cars.

The York Furnace Electric Company, Lancaster, Pa.—to own and control water power from the Susquehanna River and develop and distribute electric current for heat, light and power. Capital stock, $1,200. Directors: F. S. Shoff, Colemanville; John W. Holman, Newton; J. Miller, G. B. Wilson and W. F. Beyer of Lancaster.

COMMERCIAL PARAGRAPH.

The American Electric Telephone Company, 36 West Jackson Boulevard, Chicago, is now handling a new device known as the Burns Individual Station Metallic Circuit Protector, which is a combination lightning arrester and sneak-current protector, the use of which affords absolute protection to a telephone switchboard. The efficiency of the "heat coil" does not depend on a fusing of the wire in the coil; it is rendered operative by the heating action of the current on a hard rubber rod which is the core of the coil, which causes it to bend sufficiently to release itself at one end and jump out of the retaining clip before the sneak-current has had time to fuse the wire or do any damage to the switchboard.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED AUGUST 28, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

656,790. Trolley. Morris T. Schaffer, Bethlehem, Pa., assignor of one-half to Edwin J. Lichtenwalner, Allentown, Pa. Filed May 4, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

656,840. Protector for Electric Lamps. Frank B. Garretson, Worcester, Mass., assignor to himself and William J. Gindele, same place. Filed March 8, 1900.

657,020. Portable Electric Lamp. Franklin W. Brooks, Washington, D. C. Filed June 9, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

656,716. Fluid-Operated Electric Switch. Charles A. Eck, Newark, N. J., assignor to the Auto-Electric Air Pump Company, New York City. Filed Feb. 12, 1900.

656,744. Device for Lighting Lamps by Electricity. Svend M. Meyer, New York City. Filed March 3, 1898.

656,806. Alternating Current Generator. Charles S. Bradley, Avon, N. Y., assignor to the General Electric Company of New York. Filed June 22, 1896. Renewed May 11, 1900.

656,870 Electric Switch. Reinhold H. Wappler, New York City, assignor to the Wappler Electric Controller Company, same place. Filed Dec. 8, 1899.

656,972. Electric Motor. Edward A. Henry, Crestline, Kan., assignor to Edward A. Henry and J. Lewis Griswold, same place. Filed March 21, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

656,703. Telephone System. Frank G. Rugh, Briar Bluff, Ill., assignor of one-fourth to Wilson W. Adams, Atkinson, Ill. Filed June 28, 1899.

656,907. Telephone Signaling Appliance for Party Telephone Lines. Josef Steiner and William H. Tuck, New York City, assignors to the Western Electric Company, Chicago, Ill. Filed Jan. 8, 1900.

656,996. Supervisory Signal for Telephone-Switchboards. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed July 25, 1898.

656,997. Signal for Telephone Trunk Lines. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Jan. 29, 1900.

MISCELLANEOUS.

656,635-656,636. Electric-Motor Suspension. George Gibbs, Philadelphia, Pa. Filed Feb. 28, 1898, May 11, 1900

656,650. System of Electrical Distribution. Alexander D. Lunt, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed June 30, 1900.

656,652. Carbon Brush. William A Markey, Saginaw, Mich., assignor to Emmet T. Bowen. Filed March 30, 1900.

656,680. System of Electrical Distribution. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed June 12, 1899.

656,700. Battery-Box. Leon W. Pullen, Camden, N. J., assignor to the Pullen Battery & Electrical Manufacturing Company of New Jersey. Filed Sept. 16, 1899.

656,780. Lightning-Arrester. William E. Athearn, New York City. Filed Feb. 16, 1898.

656,796. Signal-Receiving Relay. George K. Thompson, Malden, and Ernest C. Robes, Medford, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed March 12, 1900.

656,808. Lock. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Feb. 10, 1900.

656,821. Means for Controlling Energy Delivered to Electrical Translating Devices. Harry W. Leonard, New York City. Original application filed Jan. 31, 1896. Divided and this application filed Jan 13, 1900.

656,828. Telautographic Apparatus, Foster Ritchie, London, England Filed Jan. 29, 1900.

656,832. Telegraphy. Henry D. Bartholomew Newark, O. Filed Oct. 12, 1899.

656,882. Charging-Stand and Contact for Storage Batteries. George H. Condict, New York City, assignor to the Electric Vehicle Company, same place. Filed July 18, 1898.

656,930. Electric Furnace. Wilhelm Borchers, Aix-la-Chapelle, Germany. Filed April 12, 1900.

656,957. Electric Signaling Apparatus. Edward B. Ellicott and Louis E Oehring, Chicago, Ill., assignors to the Western Electric Company, same place. Filed May 2, 1899.

956,961. Means for Securing Pole-Pieces. Henry Geisenhoner, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 6, 1898.

656,977. Electric Lamp for Miners' Use. Leo Horwitz, Berlin, Germany. Filed Feb. 21, 1899.

656,982 Electrolytically Treating Scrap Tin. Edward D. Kendall New York City. Filed Nov. 20, 1899.

657,012. Apparatus for Electrolysis. Paul Schoop, Wildegg, Switzerland. Filed Aug. 17, 1899.

657,032. Apparatus for Electrolyzing Ores. Albion M. Rouse, Denver, Col., assignor of one-half to William G. Shedd and Frank Brooks, same place. Filed Nov. 1, 1899.

DESIGN.

33,131. Battery-Cell. David H. Darling, Jr., Rye, N. Y., assignor to the United States Battery Company, New York City. Filed July 19, 1900. Term of patent 14 years.

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THE TELEPHONE WORLD.

Racine's New Telephone Company.

Articles of incorporation for the Citizens' Telephone Company were filed at the register of deeds office a short time ago. The incorporators are Frank L. Bliss, Charles R. Carpenter and John B. Simmons. The capital stock is $125,000, and the objects of the company are to operate and conduct the telephone business of Racine.

The system will be operated under the franchise granted to Allen Shewmon in October, 1899. This franchise provides that the city of Racine shall receive free telephones and that wires shall be placed underground on all of the leading streets of the city. Mr. Bills, who has been in Racine for some weeks soliciting subscriptions, says that he has 180 and that of $60,000 stock wanted $40,000 has been pledged. All of the stock is and will be owned exclusively by Racine people. Work of construction will be commenced about September 15. Arrangements have been perfected for lo g distance 'phones to the north and south and a considerable territory in the west.

It is expected that the new company, being entirely made up of Racine people, will seriously cut into the business of the Wisconsin Telephone Company. Recently the Wisconsin people made a canvass of the city and now have 1,000 'phones in operation. They are just completing a new station where it is proposed to put in one of the latest switchboards, but it will be over one year before the new quarters are occupied.

A conference between E. M. Prindle of Providence, R. I., and Judge A. Van Wagenen, of the Clark Automatic Switchboard Company's directorate, and E. A. Clark and John Van Wagenen was held recently in Sioux City, Ia. Mr. Prindle is general manager for the switchboard company, and went to Sioux City especially to meet the men of that city. "We are consulting regarding mechanical features of the business," said Mr. Prindle. "We have orders for more than 4,000 'phones, and we have just placed our first factory order for 1,000 of this number." Of this new switchboard company, which has been organized with a capitalization of $1,500,000, William B. Branigan, of Providence, is president.

The Southern Indiana Telephone Association was organized at Huntingburg recently and the following officers elected: G. A. Kienley, Huntingburg, president; C. D. Knoefel, New Albany, vice-president; Ernest Pickhardt, Huntingburg, secretary; Samuel Doan, Jasper, treasurer. An effort is being made by the association to arrange for a long-distance co-operative service among the independent telephone companies. All the companies of Southern Indiana, excepting those of Crawford County, had representatives at the meeting. It is the intention, should the plan be successful, to have long-distance service by the various companies between New Albany, Evansville and St. Louis and all intervening points.

The National Telephone Company is rapidly perfecting its plans for putting in its telephone system in Wheeling, W. Va., and the directors are highly pleased over the outlook. The solicitors have already booked 550 subscribers, and the 1,000 mark will be reached, it is thought, before long. Bids for the construction of the underground system are being received by Secretary Handlan. This work will begin about the middle of this month.

Straus Bros. & Co., brokers, of Ligonier, Ind., have formed a syndicate and purchased the entire exchange and toll line system of the Warsaw (Ind.) Telephone Company. The price paid is said to be about $20,000. The purpose is to give the American Bell Company stiff competition with the independent lines.

The Sullivan County Telephone Exchange held a meeting of the stockholders lately at Monticello, N. Y., at which they decided that they would supply business places with telephones at $18 per year, and private residences—three on a circuit—$12 per year.

The Tucker Manufacturing Company of York, Pa., which has a contract with the Government to furnish telephones, recently shipped another consignment of seventy-five instruments to Porto Rico.

Connection was recently made by the Delmarvia Telephone Company of Wilmington, Del., with the West Chester and other companies, by which the local company can now reach about 27 towns in Pennsylvania.

A company has been organized in Middleboro, Ky., to build a telephone line from that city to Pineville, the county seat. The construction of the line is now under way and will be finished shortly.

The People's Telephone Company of Lockport, Ill., has certified to an increase in capital stock of from $12,000 to $15,000.

At the annual meeting of the stockholders of the South Shore Telephone Company at Freeport, L. I., last week, 516 shares were represented. The entire board of directors, composed of H. P. Libby, George W. Bergen, William G. Miller, John J. Randall, Charles D. Smith, W. D. Carter and George P. Bergen, were re-elected. August Inning and Valentine G. Walters were also re-elected inspectors. The annual statement showed that the company is operating forty miles of line with a total of 358 subscribers, divided as follows: Freeport, 105; Rockwell Center, 69; Hempstead, 49; Roslyn, 29; Baldwins, 21; Lynbrook, 19; Mineola, 19; Long Beach, 11; Oceanside, 8; Hyde Park, 8; East Rockaway, 6; Merrick, 4; East Williston, 4; Greenwich Point, 3; Albertsons, 2; Uniondale, 1. The company has been granted a franchise for the extension of its lines into Oyster Bay Town, and arrangements are about complete for the commencement of the work. After the line has been constructed, it is proposed to put in a central office at Sea Cliff. The directors met immediately after the stockholders' meeting and elected the following officers for the next year: H. P. Libby, president and general manager; George W. Bergen, vice-president; William G. Miller, treasurer.

The new trunk line system of the Delmarvia Telephone Company is now opened for public service, and Delmarvia subscribers in Wilmington, Del., can talk with a half hundred or more towns in Pennsylvania. All the telephones are long-distance instruments, with metallic circuits, and the company promises prompt service. The following rates from Wilmington are for a five minutes' connection, for each minute or a fractional part of a minute an additional charge will be made equal to one-fifth of the regular rate: Coatesville, 20 cents; Collegeville, 25 cents; Conshohocken, 25 cents; Downingtown, 20 cents; Lansdale, 30 cents; Malvern, 20 cents; Norristown, 25 cents; Pennsburg, 30 cents; Phoenixville, 20 cents; Pottstown, 25 cents; Royersford, 25 cents; Souderton, 30 cents; West Chester, 15 cents. Avondale, Kennett Square, Unionville and West Grove will be connected in a short time. The new books are now in the printer's hands and will be issued soon. They will contain the new subscribers' names, and will show that the Delmarvia is very much in evidence and not on the wane.

A milion dollar independent telephone company has been organized in Louisville, Ky., and purposes to divide patronage with the Bell Company. An ordinance was introduced in the general council to grant a franchise to this company on a very low basis of charges. E. M. Coleman is the representative of the new company, which, he says, is ready to be incorporated with $1,000,000 of stock. It is to be known as the Louisville Independent Home Telephone Company. He promises that its rates shall be one-half of what the Bell Company charges. He says that an exchange and a telephone system, to cost $450,000, will be built in Louisville, and that the remainder of the capital will be devoted to building up independent lines in Kentucky. The company which owns the present Louisville system is the Cumberland Telephone Company, a Bell organization. It has a complete system, but has no exclusive franchise.

Since the increase in telephone rates recently announced by the Southern Bell Telephone Company of Norfolk, Va., the Southern States Telephone Company has advanced its rates to the full limit allowed under its charter, viz.: $38 for business and $28 for residence 'phones. The manager of the Southern States Company is preparing for a big increase in business as a result of the high rate of the rival company, and will make a number of improvements in the service, including additional cables to Norfolk.

The county commissioners of Fort Wayne, Ind., have granted to the New Haven Telephone Company a franchise including the right to construct lines from New Haven to Garr Creek, Shirley City, Baldwin, Edgarton, Adams Station, Maples, Harlan, Cedarville and Leo, all within Allen County. The Fort Wayne companies will doubtless make connecting arrangements.

Attorney J. E. Boyton and Ed Stephenson of Waco were recently in Austin, Tex., on business with the Department of State relative to the securing of a charter by which the independent telephone company of Waco and an independent long-distance line will consolidate and string other long-distance lines.

It is announced that the Northern Oklahoma Telephone Company has disposed of its lines in Kay County to the Arkansas Valley Telephone Company. The consideration is said to be $10,000.

The long-distance telephone system of the Cumberland Telephone Company is now entering Florence, Ala., and instruments will be put in at once.

The switchboard of the Independent Telephone Exchange at Whitewell, Tenn., was installed a short time ago. The switchboard is of the American Telephone Company's latest improved, self-restoring drop pattern. The instruments are of the long distance type and the construction of the lines is of material and character calculated to last and insure best service. The rates are $1 per month for private residences and $1.50 per month for business houses to subscribers within one mile of central with a proportionate increase for longer distances.

Articles of incorporation of the Farmers' Telegraph Construction Company of Milwaukee, Wis., have been filed. The capital is given as $500,000, and it is said that the offices of the company will be in Milwaukee. Some time ago articles of incorporation were filed for the Central Telegraph & Telephone Company with a capital of $10,000. This name is now changed and the capital is increased. The incorporators are Charles Sawbill, A. E. Redfield and Martin Maylan.

The Central Union Telephone Company of La Porte, Ind., has purchased the entire plant of the La Porte Telephone Company, operating a local system and toll lines to Michigan City, Westville, Chesterton, Valparaiso, Union Mills, Hanna and Kingsbury. By this move the Bell Company gains an entrance to La Porte where the council had repeatedly refused it a franchise to operate in opposition to the local organization.

The city council of Huntsville, Ala., has received a schedule of rates presented by the Bell Telephone Company. The aldermen are not satisfied, and the company will be asked submit other figures. If the Bell Company cuts rates to the figures considered by the council to be just, it is not likely that a franchise will be granted the independent telephone company, because it is believed by the council that if one company will give the people the benefit of the lowest rate it will be better to have no competitor in the field.

The Rawson Electric Company, which is trying to secure a franchise to establish a telephone system in Batavia, N. Y., will not be allowed to do so without a struggle, as the board of aldermen have received an invitation from the Bell Telephone Company to visit Niagara Falls and inspect both systems, which are in operation there, and see the difference.

The Inter State Telephone Company, which, in connection with the Home Telephone Company of Trenton, N. J., is opening up suburban communication, is meeting with considerable opposition in Bucks County. The farmers on the Inter-State Company's line between Trenton and Norristown, Pa., have put up a hard fight against the telephone line, in some cases chopping down the poles erected by the company.

The Dundee (N. Y.) Electric Light Company proposes to install a telephone system between Dundee and Eddytown, with an extension plug board at Dundee. It needs complete line equipment for this work, including instruments, cross-arms, insulators, wire, pins, plug board, etc. Address E. L Bailey, Dundee, N. Y.

The National District Telegraph Company of Louisiana, Limited, has been incorporated to construct and operate systems of telegraph, telephone and electrical service. The capital stock is $100,000.

The Kinloch Telephone Company of St. Louis, Mo., has paid over to that city about $16,000, which was 5 per cent. on the gross earnings during the 18 months the company has been in operation.

The city council of Portland, Ore., has passed an ordinance requiring telephone companies operating in that city to pay a license fee of 5 cents per month for each instrument.

The new telephone line between Susquehanna and Forest City, Pa., is gradually approaching completion.

A local line of telephones is being established in Bowdoinham, Me.

TELEPHONE INCORPORATIONS.

The Monticello Telephone Company, Monticello, N. Y. Capital stock, $2,000. Directors: Martin La Tourrette, E. H. Strong and D. S. Yeoman, all of Monticello.

The Farmland Telephone Company, Farmland, Ind. Capital stock, $1,000. Directors: T. W. Botkin, W. C. West, N. D. Good, J. T. Wright and John Nixon.

The Independent Telephone Company, El Paso, Tex.—to construct and operate a telephone exchange. Capital stock, $51,000. Incorporators: J. S. Dodge, T. B. Dockery, Mark Muler and F. B. McElroy.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Baltimore, Md.—Mayor Hayes is looking into the feasibility of a plan to install an electric light plant in the Druid Hill Park pumping station, and there generating enough power to light the arc lamps used throughout the park.

Blair, Wis—Lovberg & Tormoen have secured a contract to erect a new power house here. The lighting of the village with electricity will be done in the near future.

Chicago, Ill.—N. Buck is preparing plans for an electric light and power plant to be built on Lake View for a stock company, which is now being organized. The plant will cost $25,000.

Crawfordsville, Ind.—In a recent fire the Crawfordsville electric light plant was partly destroyed, entailing a loss of $40,000. The work of rebuilding will be commenced at once.

Dickson, Tenn.—Nashville capitalists will erect an electric plant and waterworks here if they can secure a franchise.

Fayetteville, N. C.—The Lafayette Knitting Mill has decided to install an electric light plant.

Fredericksburg, Va.—T. McCracken, J. P. Rowe and L. Perry are the council committee on light at this place and will receive bids until September 18 for building and equipping an electric light plant of 80 lamps of 2,000 candle power.

Glens Falls, N. Y.—Extensive plans have already been made for rebuilding the electric light station of the Glens Falls Gas & Electric Light Company. Three engines and six electrical generators, which will require from 600 to 700 horse power, will be installed.

Hamlet, N. C.—This place is to have an electric light plant in the near future.

Hart, Mich—A recent electrical storm here put the electric light plant out of business.

Harrisburg, Pa.—The county commissioners lately decided to light the county jail by electricity.

Indianapolis, Ind.—The board of public works probably will refuse to renew the contract for lighting certain resident districts with gas and vapor lamps during the coming year, but may decide to figure only on electric lights.

Jefferson City, Mo.—The city council has rejected all bids for lighting the city, and will erect its own electric light plant.

Kasson, Minn.—The Kasson electric light plant and building were burned recently. Much damage was done to the boiler and engine, and the dynamo was a total wreck.

Lincoln, Ill.—The city council is discussing the question of erecting an electric light plant.

New York City.—Sealed proposals will be received by the committee on buildings of the board of education of this city at the hall of the board, southwest corner of Park avenue and 59th street, Monday, September 10, where plans and specifications may be seen and blank proposals obtained for heating and ventilating apparatus and electric lighting plant for new public schools 124 and 125; for additions and alterations to heating and ventilating apparatus and new electric lighting plant for public school 56.

Orange, Cal—The citizens of this place are agitating the question of erecting an electric light plant.

Orion, Ill.—The village board recently voted to let the contract to a Ft. Wayne, Ind., firm to build the electric light plant.

Owensboro, Ky.—This city will build an electric light plant for municipal lighting.

Oxford, Miss.—The city will issue $25,000 of bonds for the erection of an electric light plant and sewerage. W. B Cowan, mayor.

Pender, Neb—This place will have electric lights in the near future.

Red Bud, Ill—The council has appropriated $10,000 for the purpose of erecting an electric light plant to be owned and operated by the city.

Richfield, Utah—O A. Whittemore, of Provo, contemplates the erection of an electric light plant here.

River Falls, Wis—The city council has let the contract for the city electric light plant, which will cost $23,000 and will be modern and up-to-date in every respect.

Sayville, L. I.—Hewitt & Warden have been awarded the contract for installing an electric light plant complete for lighting this village.

Scranton, Pa.—The Consolidated Electric Light Company is improving its service to an extent which, it is claimed, will make this one of the best lighted cities in the country.

Searcy, Ala.—S. E. Drinkwater of Memphis, Tenn., has received a franchise for the erection of an electric light plant here.

Whitehall Wis—This village is negotiating for the purchase of a 1,000 light dynamo.

Winchester, Tenn.—C. F. Gattis of this place is in market for an electric light plant.

STREET RAILWAYS.

Augusta, Me—A well-known Maine man who is interested in electric roads recently said that if the proposed electric road between this city and Lewiston is built the coming year that he is satisfied that a road will be built from Lewiston through Mechanic Falls to South Paris and perhaps to other places in Oxford County.

Brimfield, Mass.—An attempt is being made to arouse interest in an electric road south through this place and Wales to Stafford Springs.

Coshocton, O.—The county commissioners have granted H. S. Sands of Wheeling, L. G. Hallock and E. D. McKee of Steubenville a franchise for an electric line between this place and Newcomerstown.

Douglas, Ore.—A project is being talked of here for a proposed electric road from Juneau to this place and Treadwell which will carry passengers and freight.

East Orange, N. J.—The North Jersey Street Railway Company is securing consents of property owners for the building of a new trolley line which will run to Orange Valley through the heart of this place.

Fort Worth, Tex.—S. B. Coffenberry, head of the Coffenberry-Bishop Syndicate of Cleveland, Ohio, last week purchased for himself and associates the two principal electric street railway lines here—the Fort Worth Street Railway and the City Street Railway.

Hartford, Ky—A project is on foot to build an electric railroad to Beaver Dam, thus connecting this place with the outside world.

Leland, Miss—The proposition to build an electric street railway from Greenville to this place is believed, from the men behind the enterprise and the interest already manifested, that the line will be built and put in operation without unnecessary delay.

New Haven, Conn.—The United Gas Improvement Company of Philadelphia and New York, it is understood, will apply next year for a charter to construct an extension to the trolley lines that now end at Woodmont over the country road a mile north of the present Woodmont line to Savin Rock, thence to this city.

Rockford, Ill.—All the right of way between here and Beloit has been secured by the Beloit & Janesville Electric Road.

San Bernardino, Cal.—The city trustees have granted a franchise to build an electric car line to Judge Campbell and J. H. Boyd.

Selma, Ala.—F. M. Abbott is at the head of the new company which owns the street railway line here, and is about to make the change from mule power to electricity.

Wheeling, W. Va.—The Northern Ohio Electric Company, which is to build a trolley line from this city to Wellsburg, W. Va., has organized permanently. H. Hazlett was elected president. The road will be 15 miles long.

Yonkers, N.Y.—It is stated that the trolley company is about to extend its line from Woodlawn along Central avenue to Yonkers avenue.

MANUFACTURING.

Boston, Mass.—A recently formed concern known as the International Storage Battery Company will manufacture and deal in all kinds of storage batteries with an authorized capital of $1,000,000. W. E. Hingston is interested.

Jersey City, N. J—The Witte Arc Light Manufacturing Company at No. 259 Washington street, will manufacture and deal in electrical supplies on a capital of $1,000,000. The incorporators are Arthur W. Perego, Thomas T. Payne, John S. W. Drether, Frank C. Freeman and O. W. Ruland.

Malden Mass—The Liberty Electric Company has been organized here with a capital stock of $100,000 for the purpose of manufacturing electric lamps, etc.

New York City.—The Challenge Incandescent Manufacturing Company was recently organized here with a capital of $60,000. Among those interested are Morris Kamber, Benjamin Fox and Jacob Hirschberg, all of New York.—Among the foreign orders just secured by the Bullock Electric Manufacturing Company, is one for 800 kw. direct current and direct connected generators for the street railway company at Alexandria, Egypt; also one large order which calls for many small generators for the Russian-Chinese Railroad Company. The company claims that from its display at the Paris Exposition it is already receiving direct results.

Troy, N. Y.—The E. G. Bernard Company of this city, has received the contract for equipping the plant of the Sandy Hill Iron & Brass Works with electric facilities. The contract includes placing the latest improved dynamo and motors. The works will be operated by electricity.

COMPANY MATTERS.

Aspen, Col.—The Roaring Fork Electric Light & Power Company recently purchased from George S. Newman the People's Light & Power Company's plant. The price paid is believed to have been about $40,000.

Ft. Wayne, Ind—J. J. Wood, general manager of the Ft. Wayne Electric Works, has succeeded in his efforts to enlarge the works. There will be an expenditure of almost $100,000 in building and equipping the plant with machinery, and the increase in pay roll will amount to nearly $30,000 a month.

Syracuse, N. Y.—The Onondaga Dynamo Company, of which James W. Eager is president and manager, reports an increase in business of 100 per cent. over that of a year ago. It is stated that a good trade has lately been worked up in Germany and South America.

POWER AND TRANSMISSION PLANTS.

Albany, N. Y.—Articles of incorporation of the Niskayuna Power Company were lately filed with the Secretary of State. The company is capitalized at $100,000. Its purpose is to dam the Mohawk River just below the State dam at the aqueduct for power purposes. E C. Brown, W. H. Fritchman, M. Montgomery, Mr. Landis and W. A. Graves are the directors.

Bloomington, Ill—A stock company is to be organized and a $60,000 electric power plant installed. The exhaust steam from the engine will be used to heat the buildings of the interested parties. These are Stephen Smith's Sons, C. W. Klemm, all the property owners along the east side of the court house square and the First National Bank.

Harper's Ferry, W. Va.—Geo. R. Bready, superintendent of the Electric Light & Power Company and of the pulp mills of this place, has purchased the Miller water right and land. He will erect a power plant upon it. It is located at Shenandoah City, two miles from here, with a fall of 30 feet, and is known as Bulls Falls.

La Grande, Ore—The La Grande Light & Power Company will utilize the falls in the Grand Ronde River at Oro Dell, one and a half miles above here, to secure power for operating the plant. As soon as details shall be arranged bids will be advertised for to include the construction of a new dam and the necessary work.

Portland, Me.—The contract work being done at Malson Falls in connection with the electric power plant is being pushed along as fast as possible.

AUTOMOBILES.

Faribault, Minn.—The Automobile Company of Chicago has been installing its machinery in the new factory in this city, and will now manufacture automobiles.

Indianapolis, Ind—The National Automobile & Electric Company, of which L. S. Dow is the manager, turned out its first completed vehicle a short time ago. It has a speed of twenty miles an hour. The company has a capacity of ten machines a week and employes a large force of men.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by Electricity from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.–Sept 4.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1¼ % Q.,	121	123
Allentown Pa.–Sept 4:						
Allentown & Lehigh Val. Trac. Co	...	4,000,000	1,600,000	....	--	15
Bridgeport, Conn–Sept 4:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md–Sept 4.						
aUnited Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.–Sept 4:						
New England Street Ry	25	5,000,000	1,061,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
bWest End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	144½	145
Brooklyn N. Y.–Sept 4:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	232	234
Brooklyn Rap. Transit Co., tr certf.	100	48,000,000	48,000,000	....	64	64⅛
cBrooklyn Heights Railroad	....	200,000	200,000	....	107	109
*dBrooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
eBrooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	322	325
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad.......pfd.	......	6,000,000	6,000,000	....	75	80
fAtlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
gBrooklyn, B. & W. B. Railroad	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.–Sept 4:						
Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.–Sept 4.						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.–Sept 4						
Charleston City Ry. Co	50	100,000	100,000	3 % S.	--	..
Enterprise City RR. Co	25	1,000,000	250,000	....	--	..
Chicago, Ill.–Sept 4						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	250	255
Chicago & South Side R. T. RR	100	10,328,800	10,328,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9¼	10
Metropolitan West Side Elev. Ry	100	15,000,000	7,000,000	Feb 28 1900.	80 [illegible]	81
Met. West Side El., pfd	100	15,000,000	9,000,000	....	79 [illegible]	80
North Chicago Street RR	100	10,000,000	6,000,000	3 % Q., Jan.	209	210
hNorth Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	13,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.........com	....	1,250,000	624,900	35 %	14½	18
Union Traction Co..........pref.	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.–Sept 4:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
lCincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.–Sept 4:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,000,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.–Sept 4:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.–Sept 4:						
City Railway Co.............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co..............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; [illegible],100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j [illegible] % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,050,-00 stock guaranteed by West Chicago Street Railway Company, lessee.
[illegible] Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.–Sept 4:						
Hartford Street Ry. Co	100	$4,000,000	$200,000	3 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	–
Holyoke Mass.–Sept 4.						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.–Sept 4.						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	3 %,	150	–
Indianapolis, Ind–Sept 4.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.–Sept 4						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	–
Lancaster & Col. Electric Ry	....	....	37,500	....	--	–
West End Street Railway	....	....	....	....	--	–
Louisville, Ky.–Sept 4:						
Louisville Ry...................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry....................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.–Sept 4						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅝	68¾
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct.	136	137
Montreal, Canada.–Sept 4						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	249	250
Toronto Street Ry. Co	100	6,000,000	6,000,000	1¼ % S., J. & J. †	100¾	100½
Memphis Tenn.–Sept 4:						
Memphis Street Railway Co	100	500,000	500,000	....	25	–
New Haven, Conn.–Sept 4:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	–
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.–Sept 4						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
aCrescent City RR..........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
bNew Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York–Sept 4:						
Central Crosstown RR	100	600,000	900,000	2½ % Q.	155	300
cChristopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	115	125
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	120	125
dMetropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	158	158¼
eBleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
fBroadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
gCen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2½ % Q.	192	200
hEighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
jNinth Avenue RR..........guar.	100	800,000	800,000	....	195	205
kSixth Avenue RR..........guar	100	2,000,000	2,000,000	....	205	225
lTwenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¾
m42d St., Manhatv'le & St. Nich. Av	100	2,800,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.–Sept 4:						
Consolidated Traction Co. of N. J	100	15,000,000	15,000,000	....	57½	59
North Jersey Railway Co	100	6,000,000	6,000,000	....	23	24
United Elec. Co. of New Jersey	100	504,000	504,000	n1¾ % A.	18	19½
Pittsburg, Pa.–Sept 4:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
oConsolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	28½	28⅝
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
pCentral Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
qCitizens' Traction Co	50	3,000,000	‖3,000,000	6 % A.	72¾	72½
rDuquesne Traction Co	50	3,000,000	‖3,000,000	6 % A.	..	...
sPittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co	50	3,000,000	‖2,994,389	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co...............com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co..............pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for $145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford, Mass Sept 4						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Sept 4						
Northampton Street Ry	100	500,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Sept 4:						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Sept 4:						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Sept 4:						
United Traction & Electric Co	100	8,000,000	8,600,000	¾ %, Oct. '98.	109	111
Philadelphia.—Sept 4						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	300,000	300,000	3 % Feb. 1, '99.	75	76
Union Traction Co........ $12½ pd	50	30,000,000	29,980,450	....	86⅞	87
*c*Electric Traction Co	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$3 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*c*Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	9_⅛	98½
*j*Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar.	50	1,060,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	000,000	‖800,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	3.0¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$3 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	261	263
Rochester, N. Y.—Sept 4						
Rochester Railway Co	100	8,000,000	5,000,000	....	15	17
Reading, Pa.—Sept 4						
*j*Reading Traction Co	..	1,000,000	1,600,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	250,000	250,000	Jan., '98.	138	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Sept 4:						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1898.	--	..
Lindell Ry	100	2,500,000	2,400,000	1½ % Jan., '99.	..	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	..
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	..	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '98.	..	..
United Electric Ry.......com.	50	500,000	500,000	....	20	21
United Electric Ry.......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99.	--	..
San Francisco, Cal.—Aug.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	375,000	$2.50 share, '98.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63½
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—Sept 4:						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
*m*Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
*m*Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	..
Springfield Ill.—Sept 4:						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.—Sept 4:						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Sept 4:						
Springfield Street Ry	100	1,200,000	1,166,700	3 % A.	207	212
Toronto Canada.—Sept 4						
Toronto Street Ry	100	6,000,000	6,000,000	1½ % S. ‖	97½	97⅝
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Sept 4:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	..
Worcester, Mass.—Sept 4:						
*Worcester Traction Co.......com.	100	3,000,000	3,000,000	....	80	81½
*Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Sept 4:						
Wilkesbarre & Wyoming Val. Trac.	100	5,900,000	5,000,000	1 %, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. ‖ Ex-div.
a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at $5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Lease transferred to Union Traction Company.
jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.
k Dividend of 10 % guaranteed by Reading Traction Company.
Dividend of 6 % guaranteed by Reading Traction Company.
Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 4						
American Bell Tel Co	100	50,000,000	23,650,000	4½ % Q., Jan.	275	282
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	99
New England Telephone Co	..	10,804,600	10,804,600	$1.50 p. sh. Feb	123½	125
New York.—Sept 4						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	102	108
*Commercial Cable Co	100	10,000,000	10,000,000	1½ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1½ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	165
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	300,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79	79½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Sept 4:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	36	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,800	2 % S.	158	..
Chesapeake & Potomac Telep. Co	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	118	120
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	123	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 4:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	45
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	--
General Electric Co. [new] .... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	187½	188
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	26
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,966,058	1½ % Q., Jan.,	63	66
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44½	45
New York.—Sept 4						
Edison Elec. Ill'g Co., New York	100	9,138,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co..........com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	--
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	188⅞	188
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Sept 4						
Allegheny County Light Co	100	500,000	500,000	J. & J.	165	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Sept 4						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	3,500,000	......	......	75	77
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	77	[illegible]
Northern Elec. Light & Power Co	10	550,000	550,000	......	12	12½
Southern Elec. Light & Power Co	10	137,500	137,500	....	[illegible]	[illegible]
Miscellaneous.—Sept 4						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	[illegible]
Eddy Electric Mfg. Co	25	......	......	....	9	12
Hartford (Conn.) Elec. Light Co	100	250,000	......	....	159	[illegible]
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	[illegible]
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	[illegible]
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	97½	[illegible]
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2 % Q ‡	201	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1½ % Q	131	132½
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 98.	..	180
Woonsocket (R. I.) Electric Co	100	......	......	....	105	108

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.
‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Sept 4:						
American Electric Heating Co	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Sept 4:						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Sept 4						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	8½	9½
United Gas Improvement Co..scrip.	50	10,000,000	......	---	--	100
Welsbach Commercial Co.....com.	100	3,500,000	......	---	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	[illegible]
Welsbach Light Co	5	525,100	......	....	46	44
Welsbach Light Co., Canada	5	500,000	......	....	1	[illegible]
Pittsburg, Pa.—Sept 4:						
Carborundum Mfg. Co	100	900,900	200,000	....	--	--
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Sept 4:						
*Barney & Smith Car Co.......com.	100	......	1,000,000	---	12	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	96
Billings & Spencer Co	25	......	....	....	22	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	56	58
Johns-Pratt Co	100	....	....	---	105	109
*Pratt & Whitney Co..........com.	100	......	....	---	3	4
*Pratt & Whitney Co...........pfd	100	....	......	---	40	60
Stillwell-Bierce Co..........com.	--	....	....	---	--	50
Stillwell-Bierce Co...........pfd.	--	....	....	2 % Sept 1, '99.	70	65
Shultz Belting Co	100	500,000	....	....	22	29
St. Charles Car Co	--	....	....	......	30	100

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Sept 4, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*119[]	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Sept 4, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " "........income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	... .	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108⅛	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
*a*Brooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1903	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
*a*East Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,835,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	......
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co..........1st mtg. 5s.	350,000	350,000	1919	......	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.................1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Sept 4, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry.......................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J & .	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co...................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	——	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Sept 4, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co..............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	......	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,020,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	114	118

St. Louis.

Date of Quotation—Sept 4, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J& J	17	118

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation—Sept 4, 1900						
Jefferson Avenue Ry.............1st mtg. 5s.	400,000	400,000	1905	M. & N.	103	105
Lindell Ry. Co.......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co.......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co.......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co.................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry.................Income 5s.	300,000	300,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	800,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	300,000	1913	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,800,000	1,787,000	1913	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	3,000,000	3,000,000	1913	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	350,000	350,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Sept 4, 1900						
Belt Ry. Co.........................Cons mtg 5s.	500,000	400,000	1920	J. & J.	......	....
Columbia Ry...........................1st mtg. 5s.	500,000	500,000	1914	A. & O.	122	......
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	900,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Sept 4, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	......
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110½
††No. Hudson Co. Ry. (N.J.).Cons. mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry.............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,398,000	1937	....	105½	106
St. Paul City Ry......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.						
‖$87,000 in treasury.						
§$960,000 res'ved to redeem prior liens.						
††$820,000 in escrow.						
					*With int'rest	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.						
Date of Quotation—Sept 4 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation—Sept 4, 1900						
Allegheny County Light Co...............6s.	500,000	....	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	....	......	M. & S.	....	......
Miscellaneous.—Sept 4 1900						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,312,000	4,312,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1995	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	3,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Sept 4, 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co..................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	105	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Sept 4, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	......	....	1904	J & D.	......	......
Worthington‖Pump Co.........................	75,000	....	......	....	115	127
Unlisted ‖Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¼@16⅜c.; Lake, 16⅜@16½c.; casting, 16⅜@16½c.

An assessment of $2.50 per share will shortly be called on Easton, Pa., Consolidated Electric stock.

According to a director, the Electric Storage Battery Company of Philadelphia is doing a very large business.

It is understood that earnings of the Union Traction Company of Philadelphia last month averaged $2,500 ahead of the same period last year.

The stockholders of the Havana (Cuba) Electric Street Railway, at a special meeting on August 30, voted to issue $1,000,000 second mortgage 6 per cent. 10-year bonds.

As far as can be learned, there is no truth in the report that the Pennsylvania Railroad Company is trying to buy up a majority of interest in the Brooklyn Rapid Transit Company.

Negotiations are under way looking to sale of the Doylestown & Bristol Trolley, operated by the Newtown Electric Street Railway Company, to the Bristol and Philadelphia Railway Company.

The Edison Illuminating Company of Brooklyn has called for redemption at 110 and interest all its bonds of 1890. Payment will be made at the Franklin Trust Company of Brooklyn, October 2.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 13@16; New York Electric Vehicle Transportation, 7½@8; New England Transportation, 3½@4; Gramophone, 35@40.

Judge Lacombe, of the United States Circuit Court, issued an order on August 31, finally discharging Hugh J. Grant as receiver of the Forty-second Street Manhattanville and St. Nicholas Avenue Railway Company. William Jay was appointed as Mr. Grant's successor as receiver some time ago.

Rapid progress is being made with the work of electrically equipping the Second Avenue line of Manhattan Elevated Railway Company of New York. The amount of work being done all over the system is greater than was ever known before since the property was built, and will still further improve a condition which officials describe as the best ever known.

There was renewed activity in Massachusetts Electric Company's securities recently, the preferred advancing ½ to 76½, and the common stock 1½ to 24½. It is estimated that the company will show earnings in excess of 3 per cent. for the common stock for the 12 months ending September 30. It is believed in some quarters that the common stock will be placed upon a 2 per cent. dividend basis early next year.

The street railway and electric lighting business in Seattle, Wash., has been consolidated under the name of the Seattle Electric Company. There were originally nine separate street railway systems, three lighting companies, one steam heat company and a gas company, each doing a certain amount of electric lighting business. In addition there were two street railway companies not in operation, making a total of twenty corporations. Of these the Seattle Electric Company now owns 14.

The Knickerbocker Telephone and Telegraph Company, recently incorporated under the laws of New York State, has filed a mortgage for $5,000,000 on all its property, rights and franchises. It was made in favor of the City Trust Company and is given to secure an issue of five thousand gold bonds of $1,000 each, payable in fifty years from September 1, 1900, with interest at five per cent. William H. Eckert and Arthur Phillips, as president and secretary, respectively, executed the mortgage. With the mortgage was filed the consent of the stockholders.

"It was said in well-informed circles," declares the New York "Tribune," "that the reorganization of the Electro-Pneumatic Company was progressing favorably, and that within a few days the property would be turned over to the new company. It is stated that holders will receive 100 shares of new stock for each 100 shares of stock of the present company. For the assessment of 20 cents per share holders will receive in return 25 per cent. in a bond, which shall bear interest at 5 per cent. per annum. This interest must be provided for before any distribution is made on the stock."

The South Side Elevated Railway Company, Chicago, has declared the regular quarterly dividend of ¾ per cent., payable September 29. Books close September 18 and reopen October 2. It is not improbable that the South Side Elevated Railroad Company's dividend rate will be increased at the coming annual meeting from 3 to 4 per cent. Several members of the board of directors are in favor of the advance, and the company is certainly making enough to pay 4 per cent. and still have a comfortable balance. Its earnings so far this year are considerably in excess of earnings for the same period last year. The figures in 1899 showed 4.52 per cent. earned on the stock. The daily average number of passengers carried in the first seven months of 1900 was 68,667, as against 59,313 in same period last year.

All the gas and electric light companies and all the trolley roads in Camden, N. J., were consolidated on August 31 and one of the biggest combinations ever formed in South Jersey was organized under the name of the South Jersey Gas, Electric & Traction Company. The officers of the new corporation are: President, Anthony Huser, of Newark; vice-president, Thomas N. McCarter, of Newark; manager, John J. Burleigh, of this city. The stockholders are Philadelphia, Camden and Trenton capitalists. The company filed with the Register of Deeds a mortgage for $6,000,000, showing that it has actually begun business. This mortgage is given to secure bonds of the company and is upon the stock of the following concerns: Camden Gas Light Company, the Camden Gas & Fuel Company, the Camden and Burlington Gas & Electric Company, the East Side Gas Company, the Gloucester Electric Light Company, the Consumers' Gas Company of Woodbury, the Woodbury Electric Light & Power Company, the Camden, Gloucester and Woodbury Railway Company.

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EDITORIAL NOTES.

The Brake Question.

The recently issued report of the State Railroad Commission on tests of street car brakes, which were made in New York City between August 31 and December 2, 1899, is attracting considerable attention in street railway circles. As will be recalled an electric brake stood first in the order of merit, and a friction brake second, but although both of these devices were proved to be more efficient than the hand brakes now generally in use, it is doubtful if the various street railway companies will voluntarily abolish the present mechanism for a better type of braking appliance without drastic measures being adopted.

President Vreeland, of the Metropolitan Street Railway Company, who furnished many facilities to the State Commission for making the tests, was recently asked if his company contemplated any changes in consequence of the Commission's report, and also for his opinion of the report in general. Mr. Vreeland said:

"In the matter of such tests, there are many things to be considered. Some men offer a brake which they say will stop a car within 30 or 40 feet. Well, it will; but who would want to ride on a car like that, making 200 stops a day? At the end of a day's run the car would be good for nothing. There is no trouble in stopping a car quickly enough if you care nothing for the car or the passengers. A stone wall across a track would stop a car quicker than anything else. It reminds me of an incident in my early steam-railroad days, when a man came to the manager of the road I was on with a device to stop a train instantly. This was to be placed on the rear platform of a car, and when a spring was released some iron claws were to shoot down and grasp the rails, bringing the car to an immediate standstill, whatever might be its rate of speed."

Mr. Vreeland added that one variety of hand-power brake was in use on all the cars of the Metropolitan system, including the heaviest electric cars. This replaced the old spindle brake about five years ago. Many accidents had occurred throughout the country in consequence of the breaking of brake-chains, but this brake was equipped with a double chain, to which no mischance had ever happened on his roads.

There is no doubt but what the brakes now in use are fairly efficient, but as the tests have demonstrated that a better brake can be had, the street railway companies owe it to the safety of the citizens that the "best" brake, and not a "good enough" brake be adopted.

President Rossiter of the Brooklyn Rapid Transit Company, referring to this subject, is reported as saying that he had not yet carefully read the report of the State Commission, although his company had been "rather waiting for it," in view of its own experiments with car brakes. Long before the tests by the State Commission, in fact for the last two years, his company had been studying the subject. About 100 of its cars were now, he said, equipped with brakes which were claimed to be improvements on the ordinary kind. A number of different devices were being tested in practical, every-day operation, including electric, friction, air, and hand-power brakes. These tests were made in the ordinary course of business, scarcely a week passing, Mr. Rossiter remarked, when some improvement was not introduced on the Brooklyn surface cars. The company was anxious to adopt the best brake there was, but he could not say when a final decision would be reached. The engineers of the company were now engaged in preparing a report on the workings of the different brakes tested.

From this it will be seen that there is little prospect of an immediate wholesale changing of braking appliances on the street cars of New York and Brooklyn, and that accidents will continue to occur as usual through the inability of the motormen to stop the cars. It would be well, therefore, were this matter brought before the coming Legislature.

* * *

Electricity in the Growing of Crops.

The application of electricity to plant life is an exceedingly interesting subject and has frequently been referred to in these columns. Experiments along this line have been conducted in this country and abroad with more or less gratifying results. Recently the New York "Journal" contained an article entitled "Growing Potatoes by Electricity," in which it is stated that a resident of Ireland has devised a system for increasing potato crops by means of atmospheric electricity. According to the publication referred to, the invention was intended prima-

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rily to check the blight, but it is now declared that it has the effect of increasing the yield of potatoes. The process consists in planting stakes with wires attached, and so fixed as to act as lightning conductors. These conductors are placed in position among the potatoes, and by drawing the electric currents in the air are said to cause them to be conveyed into the ground without coming in contact with the leaves or stalks of the potatoes.

The article says:

"Last October Mr. John Horan, civil engineer and county surveyor of Limerick, inspected three beds of potatoes among which the protecting wires were fixed. The first plot was protected by wires attached to stakes some seven feet long, fixed in the ground about one foot deep and cross-connected by additional wire. The second had shorter stakes cross-connected but without the upright wires, and standing some four feet out of the ground, and the third and last plot was enclosed in a sort of cage of wire setting. From these protected beds potatoes were dug out, and the yield compared with that of three plots of similar size selected at random from an unprotected area, with the result that the output from the first protected and unprotected plots was thirteen pounds and seven and a half pounds, respectively; of the second, thirteen pounds and seven pounds, and of the third ten and a half pounds and seven pounds."

Mr. Horan gave it as his opinion after the experiments that whether the system would prevent blight or not, it at any rate gave the enormous increase of 80 per cent. in the crop, and all of equal quality, as compared with the yield in other parts of the land.

We infer from the tone of the article that this method of applying atmospheric electricity to the roots of plants is considered a new one. Such, however, is not the case, as an apparatus known as a geomagnetifere, was brought out a number of years ago for collecting atmospheric electricity and used to a limited extent by the farmers in certain portions of France. This collector, which apparently much resembles the arrangement made use of by the resident of the Emerald Isle, consists of a high pole, surmounted by a crown composed of numerous copper spikes insulated from the pole by a porcelain knob or any other dielectric. A copper wire is connected to the spikes, which form the collector, and leads the current to a network of wires placed below the surface of the ground, in which the vegetables or flowers are to be grown. As there is always more or less electricity in the atmosphere, a small amount was collected in this way, which materially tended to stimulate the growth of the plants.

The experiments in Ireland are not remarkable through their novelty, but rather owing to the increase of 80 per cent. in the crops.

* * *

The Convention of the International Association of Municipal Electricians.

The Fifth Annual Meeting of the International Association of Municipal Electricians, which, as stated in our issue of August 29, will be held in Pittsburg, Pa., from September 25 to 27 inclusive, promises to be the most instructive and enjoyable meeting ever held by that Association, if the work of the various committees count for anything.

Some dozen papers will be read on subjects, which, judging from the titles, should prove very interesting to the electrical fraternity in general, while arrangements on a most elaborate scale are being perfected looking to the enjoyment of the delegates and their wives and daughters.

During the evening of the 25th there will be a trolley ride on the lines of the traction companies, which will afford the visitors unique views of the cities of Pittsburg and Allegheny by night. Hundreds of mills, furnaces and manufactories, belching forth their tongues of light and fire, like "hell with the lid off," as Mark Twain put it, will make the scene one long to be remembered.

The carriage rides for the ladies over the boulevards and through the parks on the afternoon of the 26th, will also be a most enjoyable affair. The east end boulevards (Grant and Beechwood) are many miles in length and run through the most beautiful and picturesque sections of the city. Schenley Park, which is filled with macadamized driveways, has more magnificent natural scenery than it could be possible for all the landscape gardeners in the world to equal, had they the wealth of the Indies back of them.

In the evening theater parties will be given for those who care to attend, and for those who care to see them, an inspection of some of the large iron and steel mills will be made.

The crowning pleasure event of the convention, however, will be the excursion and banquet an the steamer Mayflower, down the Ohio River at Davis Island Dam, seven miles and return, then up the Monongahela River, forty-five miles and return, on the afternoon and evening of the 27th. The Tariff Club Quintet, C. F. Harris, manager, and H. P. Ecker, City Organist, of Allegheny, will furnish music for the occasion. On this trip an elegant view of the confluence of the Monongahela and Allegheny Rivers forming the Ohio, will be obtained, and of the magnificent bridges which span these rivers. Around what is known as "The Point" cluster at this season of the year, coal fleets aggregating upwards of 10,000,000 bushels of "black diamonds," ready to be towed south when a "barge stage" comes along. Old Fort Duquesne is still standing near "The Point," and may be seen, and the Western Pennsylvania Exposition buildings as well. Passing on down the Ohio the largest gas tank in the world will be seen looming up many hundred feet in the air, on the Allegheny side, and the Pittsburg Locomotive Works, the Western Penitentiary, one of the finest penal institutions in the country, the great Schoen Steel Car Works and hundreds of other interesting sights and scenes on both sides of the river. By means of ingenious machinery Davis Island Dam may be raised or lowered at the will of the engineers. When the river is low the wickets are raised, producing a good stage of water in the harbor, and when it is high they lie flat on the bed of the stream.

In short, the municipal electricians who are fortunate enough to be able to attend the coming Convention should be amply repaid for their trouble by the pleasant outing which they will enjoy.

THE terrific storm, attended with so much loss of life and damage to property, which visited Galveston and Houston, Texas, a few days ago, ruined the electric light plants in both cities and made it impossible to reach Galveston either by telephone or telegraph. The Erie Telephone Company alone suffered a loss of $50,000.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE new lightship, to be anchored at Diamond Shoals off Cape Hatteras when in commission, was launched last Monday at Weymouth, Mass. This lightship will be propelled by steam and lighted by electricity.

IN Austria the use of electrical power distribution in mills and factories is becoming widespread and almost universal in the important textile industry. Recently a plant has been installed at Roveredo in the South Tyrol, in which 400 velvet-weaving looms are operated by polyphase electric motors from a central power station. Severe practical tests are said to have shown high efficiency and entirely satisfactory operation.

IN the presence of President Errazuriz and the local authorities the electric tramway system of Santiago de Chili was formally inaugurated on September 2. The public was generally delighted at the outcome and the installation of similar methods of transport will rapidly multiply.

WHAT is practically a third-rail system of electric railroading has lately been on exhibition in the Wallabout Market, at Flushing and Washington avenues, Brooklyn. It is the patent of the Union Electric Construction Company of Philadelphia, and is called the closed conduit system. It is a system founded upon three well-known laws of nature, using as its fundamental principles electricity, magnetism and gravitation. The main feature is the entire absence of trolley wires or poles, and the absence of the usual groove in the center of the tracks which in previous trials has proved such a nuisance in times of snow. Under the car are placed magnets, which raise the cable hidden entirely from view by a board covering which is as strong as the usual granite blocks. As the car passes the cable is raised, and after it has passed the cable drops by its own weight. By this means the only parts of the track that are charged with electricity are those under the car and for a distance of 5 feet both in front and behind.

VARIOUS attempts have been made in Germany, says the London Electrical "Engineer," to devise a means whereby the destructive influence exerted by the passage of heavy electric tram-cars upon asphalt pavements may be counteracted. Hitherto these endeavors have been without definite result, but much has been said lately in praise of a system which is shortly to be subjected to a practical test in Berlin. Contrary to ordinary practice, in which the tram rails are laid immediately upon a foundation of concrete, further resting in direct contact with the superimposed asphalt, the new method consists in laying the rails upon a bed of coarse gravel, and running a line of hardwood blocks along either side. Experience has taught that ordinary pavements, with gravel and stone foundations in place of concrete, offer the greatest resistance to the influence of electric cars. It is assumed that the gravel or stone allows the rails more play, which is advantageous, in that, despite great care in their manufacture, it is impossible to ensure exact uniformity with the gauge of the cars. The new method is also relied upon to reduce the noise caused by the cars running over the lines.

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A SPECIAL cable dispatch to the N. Y. "Sun" states that at the meeting of the British Association for the Advancement of Science at Bradford on September 8, Sir William Preece, ex-president of the Institution of Civil Engineers, announced that he had successfully transmitted intelligible speech eight miles across sea without the aid of wires and that the establishment of such a system for commercial communication was practicable between ships or between ships and the land.

A NEW form of impulse turbine or water motor has been placed on the market by a resident of Halifax. The revolving wheel is contained within a wheel case, there being somewhat less than the usual amount of clearance between the vanes and the inside of the case. Instead of the water from the jet being received by the vanes and thrown out radially the vanes are bifurcated so as to throw the water out sideways, the water being thus discharged clear of that part of the wheel-case in which the wheel revolves. It is claimed that with this construction a minimum of friction is obtained between the water and the wheel, and that a high efficiency is the result.

PREVIOUS to the closing of Brandywine Springs Park at Wilmington, Del., for the season a novel electrical display will be given. Lights will be arranged so as to represent various symbols in different parts of the park and will be worked automatically. The details are now being completed by the park management. It is promised the display will be unlike anything ever seen in that section.

A NEW tube mill is being planned which will be erected at Sharpsburg, Pa. In this mill tubing from nine inches to 24 inches is to be made. The building will be 430 feet long and over 100 feet in width. The rolls will be equipped with independent electric motors, served with current from powerful dynamos in the electrical building already erected and equipped. When this new building is finished —which will be about January 1, 1901—this mill with the one recently completed will form one of the largest tube-making plants in that vicinity, and the only one in the world run exclusively by electricity.

PREPARATIONS for the two automobile shows to be held in this city go right along, and while each manager works independently of the other the exhibitors seem disposed to consider both together. The garden show which will run from November 3 to 10 would of itself be rather short and the exhibition space is exceedingly limited. Followed however as it will be by the longer show at the Grand Central Palace (Nov. 14 to 24) with its abundance of space affording a better display, it will give the trade an uncommon opportunity to reach the people of the East. Another point in favor of the Palace Show is that it will be held simultaneously with the Horse Show, which is such an important feature in New York that more than 50,000 visitors from out of town attend each year.

AN original entertainment was introduced at Newport, R. I., this season in the shape of a jungle party. A coach house was transformed to represent a jungle, the outside being covered with brush, boughs of banyan trees, and moss, and among the foliage were placed stuffed monkeys, electric snakes, and other animals and reptiles, all making the same cries and noises as in their native forests. Special electric light installations had been made and the illuminations were magnificent. The tables were arranged like those at a Roman feast. As the guests took their places the inmates of the menagerie were turned loose, and the blinking eyes and roaring noises gave a startling impression that they were surrounded by wild beasts. The rolling eyes and grinning mouths of the animals were cleverly illuminated by ingenious electrical devices of various colors. When this was over there came a display of fireworks and music by the Hungarian band. A novel feature was half a dozen realistic-looking snakes that were seen crawling through the improvised trees.

ACCORDING to a report from the Toronto, Ont., "World" the Eastman Electric Cloth Cutting Machine, to be seen in Machinery Hall, is exciting more than ordinary interest. The invention has proved of immense advantage to large firms as a time saver, and many manufacturers have availed themselves of such a cheapner of the cost of manufacture. The little machine in the hands of a skillful workman is capable of cutting out 2,500 pairs of pants in a day and keeping seven markers hustling to keep pace with it. The machine is light, durable, and works perfectly.

THE success of the automobile race last Thursday at Aquidneck Park has started a very lively discussion regarding the need of a track at Newport, R. I., for all sorts of racing. It is proposed to form an association for the purpose of having a track built and operated during the fall months and making automobile and local trotting events among the cottagers and townspeople regular events. Such a track, it is claimed, could be built on the ground which was intended for the polo field.

S. N. SMITH, inventor of the electric submerged motor, has recently been giving his invention a practical test on Wilson Creek in Menomonie, Wis. The motor complete weighs twenty-seven pounds, can be attached to any rowboat in a moment and, it is claimed, works successfully.

PLANS for extensive alterations to the car barns of the Metropolitan Street Railway of this city on the west side of Eight avenue, between 49th and 50th streets, were filed at the building department a short time ago. A feature of the alterations will be the providing of a place where electric vehicles may be recharged. A. V. Porter, the company's architect, has estimated the cost of the improvements at $35,000.

THE State Department has been informed that an alcohol automobile plow is in operation at Oberursel, near Frankfort, and is 25 per cent. cheaper than the ordinary steam implement. Consul-General Guenther, who makes the report on the automobile plow, says it is a twenty-horse power machine. "Confidence is expressed," he writes, "that coal can in some cases be substituted by alcohol which can be procured everywhere at a low cost. The problem of using alcohol for power purposes has been solved by the motor factory in evaporating denaturalized alcohol of 90 degrees. The construction and operation of the motor is, after this gasification, the same as that of a gas motor. The machine uses about a pint of alcohol an hour for one horse power."

MR. STANDAGE, in a recent issue of "Engineering," London, directs attention to the inflammable properties of the ordinary materials used for insulating purposes for street mains; and suggests that a non-fusible substance should be sought, with a view to diminishing the dangers that lurk in electrical installations. He points out that gutta-percha melts at a low temperature and is very inflammable, and that this is also the case with shellac and paraffin wax. But he has observed that glue may be utilized as a less fusible and less inflammable basis for a dielectric. There is a good deal to be said in favor of going wider afield for dielectrics. Glue, and the gelatines generally, may be treated in many ways so as to render them water-proof, and it is quite possible that for some purposes an effective dielectric could be obtained from a judicious mixture of this character. It is doubtful, however, whether it would be durable, and it is more than doubtful whether it would satisfy the specifications to which manufacturers have to fabricate their wares.

G. AHLFELD of Darmstadt, Germany, has recently patented an electric lamp of the Nernst type. He forms, by means of a mold, a filament composed of some of the refractory earths. This filament is burned to give it density and hardness, and then a strip of some one of the highly infusible metals of the platinum group, mixed with an ethereal oil, is painted on the filament from end to end. This stripe is allowed to dry, and is then burned into the filament after the manner generally in use in the ceramic industry. There is thus obtained along the filament a thin line of metal which is firmly adherent, and which serves to start the current through the filament, by heating the latter until its conductivity is sufficiently raised. The method of doing this heating in the original Nernst lamp was by means of a match.

REPORTS from abroad state that one of the growing industries in Bavaria is the manufacture of calcium carbide and acetylene. A well known electrical firm in Nuremberg has acquired water-power at Sarpfoss, in Norway, and also at Glommens, and other firms have obtained similar rights representing from 20,000 hp. to 40,000 hp. for the electrical production of calcium carbide. Acetylene gas is largely used in Bavaria for various lighting purposes. The first acetylene gas works for lighting small towns were erected at Hassfurt, a town of 2,500 inhabitants. There are no less than 26 small towns in Germany thus lighted.

The Edison Illuminating Companies' Convention.

The Association of Edison Illuminating Companies met at the Grand Union Hotel in Saratoga, N. Y., on September 4, 5 and 6. Thirteen papers were read and discussed (for subjects see ELECTRICITY August 29), but the papers and discussions, as has been the habit of this Association were not given out for publication.

The meeting was very well attended, there being in the neighborhood of 100 delegates present, representing the leading electrical manufacturers and lighting companies of the United States.

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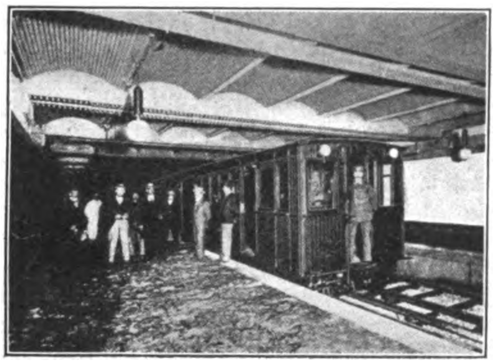
THE METROPOLITAN RAILWAY, PARIS.*

The history of the scheme, which has been proposed at various times during the past 45 years, for a convenient suburban traction service in Paris, is very interesting. It shows perfectly what wonderful effects and what changes in ideas have been the result of successful electrical traction. There were constant discussions and dissensions as to whether an overhead or an underground system should be adopted. In the early days when steam driving was the only means at hand to serve the purpose, the advocates of the overhead line were in the majority; naturally they did not wish to travel in underground tunnels, where smoke, steam and other foul vapors were present.

Of late years, however, the advocates of an underground system for Paris have been in the majority, since the objections just mentioned have been entirely removed by the successful introduction of electrical traction.

Eventually it was decided to install an underground system of electrical traction. When completed there will be about 26 miles of track of which 8¾ miles were opened to the public and commenced operation on July 19th of this year. The part in operation consists of about 6 miles length between La Porte de Vincennes and Porte Maillot, and two short branches, viz., from Porte Dauphine to Place de l'Etoile and from the Trocadero to Place de l'Etoile.

The whole of the line is double tracked,



Lyon Station.

with the exception of some very short single track loops at junctions and at terminal stations.

The subterranean tunnel of the double track has an elliptic vault about 23 feet wide, 7 feet high, and 1.7 feet thick; the vertical sides are 2.5 feet thick and 9.5 feet high; the floor is of the shape of a reversed vault, and is 1.5 feet thick, the deepest point of floor surface being 2.3 feet below the rail head.

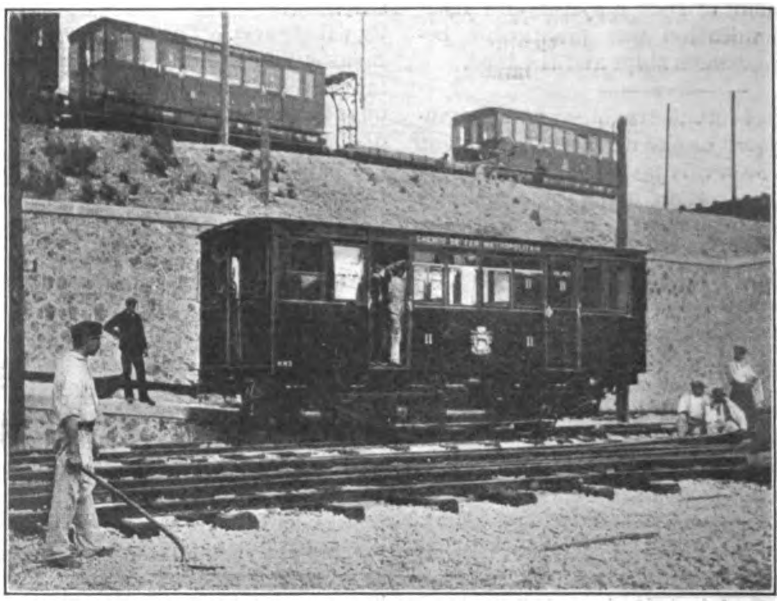
The interior of the tunnel is lined with a thickness of 0.76 inch of Wassy cement on the vault, and a similar coating of Portland cement lines the walls and the floor.

On curves with a radius of less than 328 feet, the width of the tunnel is increased. With curves of 300 feet radius, the width of the tunnel is 24 feet; with curves of 160 feet radius, the width is 25 feet approximately.

The single track tunnel has a vault of semicircular shape of about 7 feet radius and 1.5 feet thick. The height of the side walls is 8.3 feet, and their thickness is nearly 2 feet; the sides are 14 feet apart at the floor, which is slightly convex, and has a thickness varying from 1.55 feet at the center to slightly less at the sides. This tunnel at the curves of less than 100 feet is constructed rather wider at the base.

The rail track is laid on cross sleepers of creosoted wood, spaced about 3 feet apart in ballast varying in depth from about 2 feet to 0.6 feet.

The track gauge is 4.4 feet, and the rails are

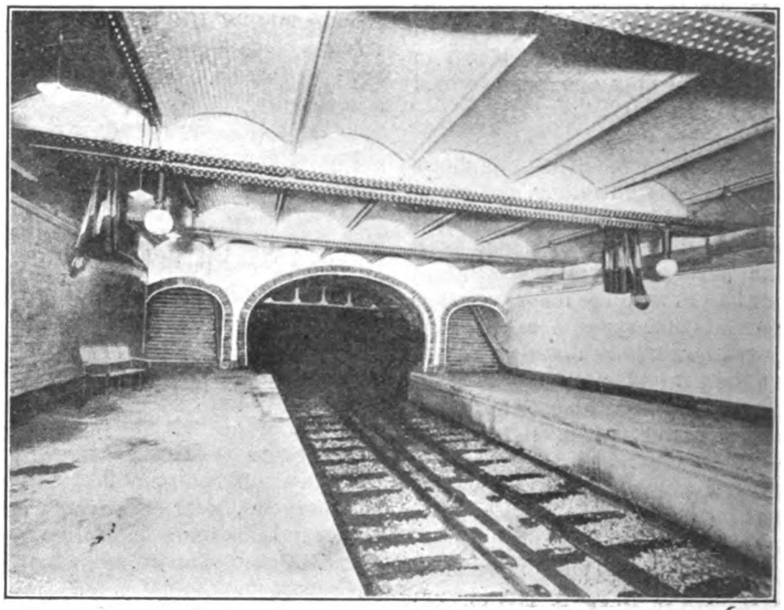


View of Carriage.

of the Vignoles type, 100 lbs. per yard, in lengths of about 50 feet. The rails rest on flat plates or chairs, the lengths being joined by four-hole fish-plates about 2 feet long.

The track is electrically equipped on the third-rail system, with track rail returns. The main rail is supported on porcelain insulators, set on extensions of every second or third track rail sleeper, according to the position of the rail joints. The conducting rail is similar to the track rails, and all joints are bonded with four copper bonds.

The stations on the parts which are in actual operation are 25 in number. The line from



Station at the Champs Elysees.

La Porte de Vincennes to Porte Maillot has 18 stations, the branch line from Place de l'Etoile to Porte Dauphine has three, and the branch from Place de l'Etoile to the Trocadero has four stations. This includes as separate stations the three distinct parts at Place de l'Etoile.

Of these stations, 17 have a vaulted roof, and are of similar construction to the tunnels, with an additional lining of glazed tiles and bricks.

Seven stations have steel girder roofs, with intermediate masonry arches, and one station alone, the Place de la Bastille, is open to the sky.

The passenger platforms are 13 feet wide, and rather more than 3 feet high above the rail-head; by this arrangement passengers step down about 5 inches into the railway train when embarking. Staircases lead from the street pavements down to the station platforms. Both the trains and the tunnels are electrically lighted; the stations with vaulted roofs are lighted by incandescent lamps, spaced about 13 feet apart, and those with the steel girder roofs are lighted by arc lamps.

The rolling stock consists of trains made up of one locomotive and two trailers. There are 46 locomotives or motor carriages; of these 34 are provided with a controller at one end only, and 12 have a controller at each end. The horseshoe arrangement of the track at each terminus obviates the necessity of running the trains in both directions, and turntables are provided should it become necessary to turn the locomotive.

* From the "Electricial Review," London.

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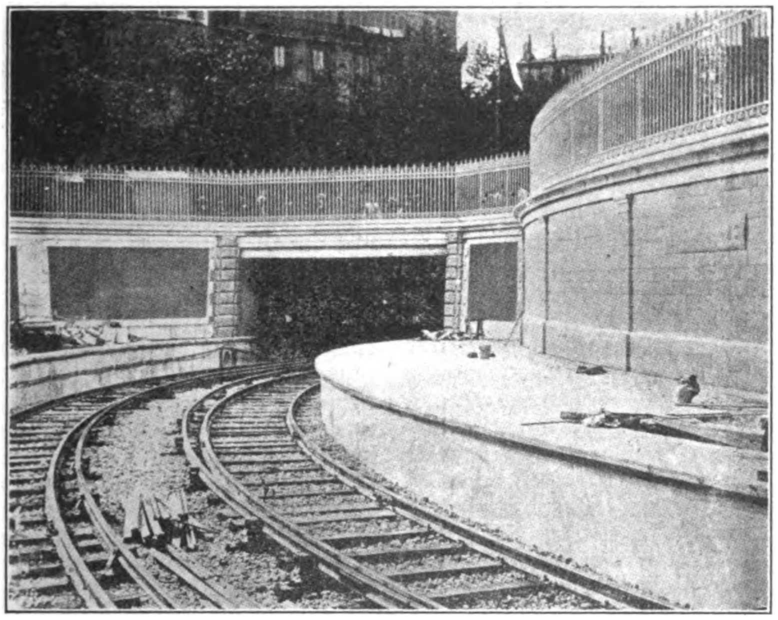
Each locomotive is equipped with two motors. They are of 120 hp. each, four-pole, and are entirely iron-clad. The pole-pieces are of soft steel laminations, cast into the iron sheathing or shell.

These motors were supplied under very stringent conditions as to their reliability and capacity for work under considerable overloads for long lengths of time. They were first put under the actual tests stipulated and in every case came up to their guarantee perfectly. They stood an overload for some time of 100 per cent., a pressure of 3,000 volts alternating current on their coils, and a pressure of 500 volts between adjacent commutator bars. The motors run on a 500-volt circuit when operating the railway.

The motors drive through a single reduction spur gearing, having the ratio as 1 : 2. The cables and mains, car lighting, automatic cut-outs, fuses, and in fact the whole of the electrical equipment of the rolling stock and track is Westinghouse, including the series-parallel controllers, which are of the well-known magnetic blow-out type. The total weight of a train, one locomotive and two trailers, with their full complement of passengers, is about 70,000 lbs.



THE ONLY OPEN AIR STATION, PLACE DE LA BASTILLE.

The generating station is situated at Bercy on the Quai de la Rapée.

The boilers are of the semi-tubular type, and are arranged in three groups of six each. The two engines are of 2,600 hp. each, and run at 70 revolutions per minute. They are direct coupled to the generators, of which there are both alternate and direct current sets. The alternate current dynamo is three-phase, and yields an output of 1,500 kw. at 5,000 volts pressure, and at a frequency of 25 per second. The direct current machine yields 1,500 kw. at a pressure of 600 volts. There is, of course, a full equipment of exciters, boosters, converters, switching devices, and also a storage battery. The three-phase current is supplied to a converter sub-station at Place de l'Etoile, and is changed to direct current at 600 volts to feed that part of the line. This sub-station is very fully equipped, and contains the following apparatus:—Nine transformers of 250 kw. each changing the three-phase current pressure from 5,000 volts to 360 volts, three converters of 750 kw. each, a battery of accumulators of 1,800 ampere hours' capacity, two boosters of 250 kw., and switchboard arrangements. Two sets of three-phase feeders enter this station and three direct current feeders leave it.

The fares charged on this line are 25 centimes for first class, and 15 centimes for second-class passengers, whatever the distance traveled may be.

The trains are now in full operation. The comfort of traveling, and the speedy means of getting from one part of the city to another without bother, crush or hurry on the part of the passengers has already made the line immensely popular, and ensured a prosperous future for this railway, for which Paris has waited so long.

ON THE MAINTENANCE OF CERTAIN PORTIONS OF DISTRIBUTING SYSTEMS AT EARTH POTENTIAL.*

BY C. H. WORDINGHAM, M.I.C.E.,
City Electrical and Tramways Engineer, Manchester, Eng.

From the very earliest days of the application of the science of electricity to practical needs, the earth, or as our American brothers prefer to term it, the ground, has played a prominent part, and each branch of electrical industry has in turn set up a claim to a vested interest in it. The potential of the earth is usually taken as zero, other potentials being reckoned with respect to it. This, however, does not accord strictly with the facts, since a difference of potential may, and very frequently does, exist between two points on the earth's surface; such difference of potential, however, is never very great. The earth in some text books is regarded as forming a large reservoir, and its office is stated to be that of maintaining the potential of a point connected to it at zero. Thus, if a battery has one pole connected to earth, and the other to one end of a long conductor, and the far end of the conductor be connected to earth so that a current flows, the earth is regarded as merely absorbing the electricity that passes along the wire by draining down its potential to the same value as the potential of the earth at the battery end of the line, and no actual current is supposed to flow through the earth back to the battery. This explanation is not borne out by experience, as the return currents can actually be detected, and it is more correct and more convenient to regard the earth as a large conductor through which the current actually does flow.

The earth may be used in two distinct ways. It may either be employed to take the place of an ordinary conductor, as in telegraphy and telephony, in which case the whole of the outgoing current has to return by the earth, or it may be employed merely to keep one of the conductors of an electrical system at or near zero potential. No one would now think of intentionally employing the earth in the former manner when energy was to be transmitted at any appreciable rate, and even for signaling circuits its use in this manner is attended with great disadvantages. We may therefore confine our attention to the second way in which the earth is employed, namely, to keep down the potential of one portion of an electrical system of transmission.

It will be convenient in considering the various practical instances of earth connections to divide the subject into high-pressure and low-pressure circuits, and to further subdivide the latter into those circuits which have a conductor earthed at one point only, and those which are earthed at more than one point. If there be a two-wire circuit, consisting of a generator, two conductors and a consuming device, such as a transformer, and if a given difference of potential be maintained between the two conductors by the generator, then if all parts of the circuit be equally well insulated, each conductor will assume a potential relatively to the earth, which is half the difference of potential between the two. In other words, if the pressure be 10,000 volts one conductor will be 5,000 volts above earth, and the other 5,000 volts below earth. If, however, the insulation resistance of one conductor falls below that of the other, the conductor's potential with respect to the earth will at once diminish, while that of the other conductor will increase, and, if the insulation of one conductor fails altogether it will arrive at earth potential, while the other conductor will alter to 10,000 volts above or below the earth, as the case may be. Now it is obvious that if the conductors be insulated only with a view to withstanding the normal potential from earth, i. e., 5,000 volts, an undue stress will be placed upon the better insulated conductor when the insulation resistance of the other falls, and this stress may be sufficient to cause the other to break down also. Inasmuch as it is impossible to foresee which conductor may assume the potential of the earth, it would appear that if both have to be insulated, both must be capable of withstanding a pressure of 10,000 volts. It was first pointed out, the author believes, by Mr. Ferranti, that, seeing that either conductor might have to withstand the full pressure, it would be best to at once face the situation and insulate one of them for the maximum pressure possible, and insure that it alone should be subjected to this pressure by deliberately connecting the other conductor to earth. This exceedingly simple, and at the same time ingenious device, at once diminished the risk of breakdown and cheapened the cost of insulation, but at the same time it enabled a further great advantage to be reaped by admitting of much greater security to life being introduced. This end was attained by completely enclosing the insulated conductor within the uninsulated one, thus rendering it physically impossible to handle a conductor at a danger-

* Paper read before the Municipal Electrical Association at Leeds, Eng., June 23, 1900.

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ously high potential, and if by any chance the outer conductor should be cut through, a short circuit would be established before the inner conductor could be touched.

This system has been almost universally adopted for two-wire high-pressure circuits, and is perfectly familiar to all at the present time, but it is worth while recording the fact that when originally introduced many people looked askance at connecting a high-pressure conductor to earth. For systems of transmission employing more than two wires the same perfect security cannot be attained, but a near approach may be made with two-phase working by employing two separate concentric cables, the outer conductors of which are connected to earth, or by enclosing two parallel conductors within an outer envelope. In three-phase working, if a star winding be employed, the middle point of such winding may be connected to earth. When this is done the stress on the insulation from earth is diminished to the smallest possible value, but all three conductors have to be insulated. It is important that one point only of the zero potential conductor should be conducted to earth, because inasmuch as there must of necessity be some fall of potential in the outer conductor, there exists between any point and the one connected to earth a difference of potential depending upon the resistance of the conductor and the current flowing through it. So long as the outer conductor is insulated from earth, except at one earth connection, no current can pass through the earth; but if a connection be established with earth at some distant point, the difference of potential between it and the other point will cause current to flow through the earth.

A digression may here be made to point out exactly the manner in which such return currents travel through the earth. A most instructive experiment carried out by the author in his student days, under Prof. W. Grylls Adams, made such an impression on him, and has been found by him to be so helpful, that he may perhaps be pardoned for describing it. In a large flat sheet of tinfoil two needles were fixed, connected respectively to the two poles of a battery, which thus sends a current through the tinfoil. A sensitive galvanometer was provided, and its ends connected each to a needle; one of these needles was stuck at random into the tinfoil, and the other was moved about on the tinfoil until a point was found which gave no deflection on the galvanometer. The needle was then pressed into the tinfoil, and an impression left on a sheet of clean paper underneath. A series of such positions were found, corresponding to an equi-potential line in the tinfoil. The first needle was then moved to a new position and a second equi-potential line traced out. When a sufficient number of such lines had been determined, other lines normal to them were drawn between the two points to which the battery had been connected. This, of course, represented the lines of flow of the current. Any-one who carries out this experiment for himself, will be at once struck with the number and diversity of the paths along which the current can flow. These paths spread out in the same manner as the lines of force from a magnet, and extend to a great distance away from a direct line.

In the case considered of a conductor carrying a heavy current and unearthed at two points of its length, the current may return from one point to the other by paths that are an almost incredible distance away from the main conductor, though, of course, the bulk of the current will take the shortest possible path through the earth. If two plates be buried in the earth at two points along a line of flow and be connected together through a conductor, this conductor will take up a portion of the current. If the conductor be part of a signaling circuit the signaling currents will be interfered with, and, with any conductor, electrolytic action may take place at one or both points of connection with the earth. If, instead of dealing with the high pressure, we are dealing with low, exactly the same effect will be produced by making one or more earth connections to a conductor, but the objects of making the earth connection are usually different. In the case of a low-pressure distribution system, the object of earthing one conductor is not to diminish the cost of the insulation, since no appreciable saving is made by using a pressure of, say, 200 volts instead of 400 volts, nor is it to secure safety to life; the chief object is to enable a consumer to be supplied at such a pressure that no one of the conductors brought into his house will exceed the limit of pressure defined by the Board of Trade to be low pressure. In the case of electrically-driven tramways, the one object is to enable the rails to be used as one conductor, chiefly with a view to simplifying the working arrangements, and partly to enable the conducting power of the rails, which must in any case be laid, to be utilized. In this last case it is obvious that the conductor is connected to earth throughout its length, and the only way to obviate the difficulties pointed out on the score of current returning by the earth is to keep the difference of potential between the ends of the earth conductor so low as to cause the amount of current returning by the earth and metallic structures buried in it, other than the rails, to be very small. With these preliminary observations we may now consider some particular cases. The author regards all the high-pressure systems as systems of transmission, though it is true that at present high pressure is still used to some extent for distribution. Inasmuch as this paper deals only with the earthing of distribution systems, the author proposes to confine his attention to these.

The most important case of earthing conductors is undoubtedly that of tramways. The system adopted so largely in America has been imported into this country, and every tramway system, excluding battery driven cars, is being worked with one conductor insulated and the other consisting of the rails connected to earth. It is well known that if the difference of potential between the end of the earthed conductor which is connected to the source of energy differ in potential considerably from that of a distant point on the same conductor, the current returning through the mass of the earth and through pipes buried in it may be very large and may cause most serious damage to the pipes by causing the metal to be dissolved at the points at which the current leaves. How great this difference of potential must be before serious damage is done is a matter upon which there is not a large amount of information available. The Board of Trade have fixed the limit of what may be allowed at 7 volts, but it is maintained by some authorities that this limit is too high and that a lower potential than 7 volts will cause damage. This point is receiving a considerable amount of attention at the present time and the author is himself engaged in a joint investigation with engineers of other departments of the Manchester Corporation with a view to thoroughly thrashing out what is the minimum difference of potential that can be allowed. It is obviously in the interests of all concerned to arrive at reliable data on the subject. If 7 volts be found to be safe, well and good, but if not the sooner it is known to be dangerous the better. All engineers must be agreed that the lower one can keep down the difference of potential the better. The object may be effected in various ways. One of the most common is to provide auxiliary conductors of low resistance which are tapped on to the rails at various points to supplement their conductivity. Another device is to employ similar conductors but to lower the potential of the far end by means of so-called negative boosters which subtract instead of add a certain number of volts. A third means, and in the author's opinion the best and most effectual, is to feed the line from a number of independent points either by means of a number of generating stations, or, preferably, by means of a number of transforming sub-stations. Except in the case of very heavy traffic this method should prove effectual without either the employment of return feeders or negative boosters.

The simplicity and reliability of the so-called overhead system of traction is such as to render it worth while to go to great lengths to retain the system, but if it be found and clearly demonstrated that extremely minute differences of potential are sufficient to cause serious damage to underground structures in urban districts, it will be necessary to reconsider the whole position, and perhaps to adopt an insulated return conductor, or else to fall back upon a battery system of self-contained cars, either of which expedients would be greatly to be deplored,

The second case of earthing in order of importance is that of one conductor of ordinary lighting and power circuits, and it is on this point that the author desires to raise discussion chiefly. It has been hotly debated, and much difference of opinion still exists as to whether it is desirable or not to earth the middle wire of a three-wire system. Let us consider what are the advantages and disadvantages of such a course. The main advantages are the following: (1) By earthing the middle conductor the extreme difference of potential that can be attained by any one of the conductors from earth is halved, and all can be handled not only with great safety, but practically without inconvenience. (2) The stress on the insulation is halved. (3) All three conductors may be taken into a consumer's premises for all pressures up to and including 250 volts pressure across the outers without contravention of the regulations of the Board of Trade. This advantage is undoubtedly by far the most important. (4) Immediate notice of a leak on one of the outer conductors is given.

The disadvantages of earthing the middle conductor are: (1) If a leak exists on one conductor, current is continually forced through it, thus causing in many cases complete destruction of the insulating material. (2) A leak on one conductor produces a short circuit on one side of the system of distribution, unless the earth connection is removable at will.

In Manchester the Board of Trade require that the middle conductor shall be maintained at or near the earth potential, and the author has now had nearly seven years' experience of this system. In his judgment there can be no possible doubt that at all events with continu-

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ous current, and quite possibly with alternating, the effect upon the insulating material of the negative main is most severe. In operating a system of distribution by means of continuous currents, it is always found that if none of the conductors be deliberately earthed those connected to the negative pole assume earth potential; the positive conductors consequently being at the maximum potential above earth corresponding to the pressure used on the system. The reason for this is well known. It is the phenomenon known as electric osmosis, whereby moisture tends to travel away from the positive pole and towards the negative pole. Whatever system of mains be employed there are always many points at which surface leakage can take place, and whether the conductors be bare copper on porcelain insulators, or be continuously insulated cables, at every point where the conductor is exposed leakage from the negative pole will take place, but if the negative conductor be kept near earth potential, this tendency will be small. If, however, the middle conductor be deliberately connected with earth so that the negative outer is kept below earth potential, a current corresponding to the amount of the leakage will be constantly forced through the leak, and the tendency for moisture to flow to the negative conductor will be maintained. If the leakage was confined to the surface of the insulation at points of connection to the conductors the result would not be so serious, but the author has found that with certain makes of rubber the material is evidently porous, and small as is the leakage current at first, it is sufficient to cause water to enter through the pores of the rubber, and the conductivity of this water so increases the leak that in course of time the whole of the rubber on the negative conductors is destroyed, large blisters forming within its substance and becoming filled with strongly alkaline liquid almost certainly derived from the substances mixed with the rubber. The rubber is often much distended, causing the liquid to be under considerable pressure. In course of time this pressure increases to such an extent as to burst the rubber, causing a hole completely through the insulating material. It is clear that the water could not merely flow into these blisters; it is almost certainly driven in by osmosis. What happens with rubber may happen with other materials and, in the author's opinion, there can be no doubt whatever that very grave risk of breakdown of the insulation of the negative conductors is introduced by earthing the middle conductor.

As a set-off against the above inconvenience it must not be forgotten that the insulation resistance of the positive conductors is substantially improved by earthing the middle one, but very little importance need be attached to this, since, as already stated, the negative conductor would be at earth potential if the middle one was not earthed and the tendency to dry the positive outer would then be doubled. The only consideration that impels me to desire to earth the middle conductor is the fact that it admits of all three conductors being brought into a consumer's premises, thus enabling every installation to be balanced within itself if it be of sufficient size to render it desirable to do so. The author is convinced that the only method of effectually balancing a multiple wire system is to carry that balancing back to every consumer except to consumers of the very smallest size and, therefore, it is of great importance to be allowed to bring the three conductors into installations. Serious as are the disadvantages this advantage is, in his judgment, sufficient to outweigh them, and, therefore, he would, on the whole, decide in favor of earthing the middle conductor, but if this be done it must be clearly understood that it necessitates the utmost care in protecting the mains from moisture, and the only possible system of laying them becomes the so-called solid system, in which every cable is completely surrounded by a thoroughly waterproof material, or an air-insulated system with accessible porcelain insulators at intervals, as in the Crompton system of bare copper. If it be granted that the middle conductor should be earthed, the question at once arises should it be permanently and irrevocably earthed or should the earth connection be capable of removal at will? The author would unhesitatingly reply "it must be removable." The first consideration is conti nuity of supply, and, if a leak developing on one conductor is to cause a short circuit the chances of interruption are increased manifold beyond what they would be if the earth connection could be removed until the fault had been localized and repaired. It is quite clear that the chances of a leak occurring on one conductor are many times greater than those of two leaks occurring on two separate conductors simultaneously. It may be argued by many that if the earth connection is liable to be removed all the advantages of making it at all are done away with, since the distribution of potential will alter when it is cut off. To some extent this is true, but it must be remembered that the connection would only need to be removed for short periods and at long intervals and, therefore, in practice but little risk would arise. If it were a question of dangerous pressures it would be entirely different; in such case the earth connection must never be removed while the main is in use. Once it be granted that the earth connection must be removable it becomes obvious that the conductors must be earthed at one point only, and that must be easily accessible from the generating station. This consideration shows that it is impossible to allow one of the conductors in a consumer's installation to be uninsulated, a system of wiring frequently advocated by some on account of its cheapness and some other advantages.

There is, however, another reason for not using this system of wiring, depending on the undesirability, already pointed out, of earthing a conductor at more points than one. It is often argued by the advocates of the system that the balancing wires carry so little current that the fall of potential in them is negligible. It is true that balancing wires frequently bring back but little current to the generating station, but locally it is unavoidable that these should be heavy currents, causing substantial differences of potential, flowing between the various installations, composing a balanced main, and these differences of potential may cause destructive electrolysis, and, with alternating currents, interference with telephone lines. Certain special features arise in connection with a distributing network fed from transforming sub-stations supplied with high-pressure current, to which attention may be called. In a case likely to become not unusual in practice, namely, that of three-phase transmission with rotary converters supplying continuous current to the network, it will probably be required that the grouping of the transformers shall be star and the middle point be earthed. Now, if this point, which is also directly connected to the middle distributing conductor be earthed at the transformer, we shall have all the disadvantages of a middle conductor earthed at several points. A much more serious case will, however, arise if, in addition to this, the middle wire be opened between two sub-stations but the outers be carried through. In such an event the whole balancing current may be conveyed by the earth and do great damage. A similar difficulty would arise with balancing transformers distributed at various points of the network if the middle wires are not continuous throughout, and an earth connection is made in the balancers. In order to comply with this condition of earthing the middle point of the transformers, the earth should be made by connecting the middle wire to the point in question and earthing this middle wire at one point only for the whole system.

The author has made no attempt to treat this subject at all fully, his desire being merely to raise a discussion on the subject generally of connecting any portion of a distribution system to earth, the chief points being: (1) Should any portion of any system of distributing conductors, whether for the ordinary supply of energy or for traction, be connected to earth. (2) If such a course is desirable what conductor or conductors should be earthed, and at what point or points. (3) What difficulties may be expected from earthed conductors, and in what way may these difficulties be met, especially in the case of distribution for electric traction purposes.

The Canadian Electrical Association Convention.

The Canadian Electrical Association held its Tenth Annual Convention at Kingston, Ont., from August 29 to 31. Addresses of welcome were delivered by Mayor Minnes, Mr. Donnelly and Mr. J. B. Pense. The annual address was delivered by President Dion. The papers presented were unusually interesting and were on the following subjects: "Conditions Affecting the Wave Form of Alternators," by Prof. L. A. Herdt; "Power Factor as Affecting Operation and Investment, With Special Reference to Induction Motors and Enclosed Arc Lamps," by F. H. Leonard, Jr.; "Rotary Converters," by A. Gordon Grier: "Use of Dynamo and Storage Battery in Telegraph Offices," by W. J. Camp.

Mr. Leonard's paper proved most interesting and instructive and was the means of eliciting a very able discussion in which many prominent engineers present took part.

In connection with other things the delegates were treated to a searchlight excursion among the Thousand Islands, as well as a boat ride. The annual banquet was held at the Hotel Frontenac on the evening of August 30 and was a brilliant affair.

On August 31 the following officers were elected for the ensuing year:

President—A. A. Dion, superintendent Ottawa Electric Company, Ottawa.

First Vice-President—E. E. Cary, manager Packard Electric Company, St. Catharines, Ont.

Second Vice-President—P. G. Gossler, Royal Electric Company, Montreal.

Secretary-Treasurer—C. H. Mortimer, "Electrical News," Toronto.

Executive Committee—Messrs. A. B. Smith, O. Higman, D. R. Street, J. J. Wright, B. F. Reesor, F. W. Simmons, W. H. Browne, J. W. Camp, John Yule and Edward Slade.

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LAHMEYER EXHIBIT AT THE PARIS EXPOSITION.

BY FRANK C. PERKINS.

The electric exhibit of Messrs. W. Lahmeyer & Co., Limited, electrical engineers and contractors, Frankfort-on-the-Main, consists of a 1,500 hp. compound steam engine running at 94 revolutions per minute, and two dynamos, one for 1,000 kw. three-phase current at 5,000 volts, the other for 400 kw. (maximum) at 500 volts; both are coupled directly to the engine shaft, as shown in Fig. 1.

The three-phase generator is of the fly-wheel type, i. e., the field magnets are fixed on the periphery of the fly-wheel and the armature on a large frame, which completely encloses the field magnets. (See diagram Fig. 2 and 3.) The speed variation during one revolution is 1-300th of the normal speed only.

By this combination of dynamo and fly-wheel the space required for the set is minimized, the material is almost entirely utilized, the magnetic leakage and the armature reaction are very small, the ventilation is excellent and efficient.

The fly-wheel consists of four pieces held together by bolts and wrought iron rings. The magnets are of wrought iron and are fixed by one wrought iron bolt and one steady pin each, so that each magnet can easily be removed, rendering it unnecessary to dismantle the dynamo. The cross section of the magnet is circular, so as to give without any excessive pressure drop a minimum of the winding length and consequently of loss of energy in the coils.

The pole pieces are almost square, so as to reduce as much as possible the magnetic leakage. They are of solid wrought iron, thus giving a more substantial construction than laminated magnets and render any resonance impossible, when the machine is working in parallel with other machines. The eddy currents generated in the magnets help to prevent a "drive" on the machines by their damping effect. Excessive heating of the machine is prevented by correct dimensions of the air space, and a suitable form of the slots in the tunnel-wound armature.

Each coil is formed by a rectangular copper ribbon, the width of which is normal to the surface of the magnet. The insulation consists of paper. By so wiring the space of the magnet is well utilized and a deformation of the coil by the effect of the centrifugal force is practically obviated.

The excitating current is generated by an exciter mounted on the same shaft as the main dynamo giving 65 volts, seen in Figs. 1 and 2.

The voltage of the three-phase generator is regulated by inserting resistance in the fields of the exciter, this arrangement doing away with the heavy resistances usually employed in the main circuit, so avoiding loss of energy and all risks of heating at the back of the switchboard.

The armature is stationary and consists of laminated iron, the segments of which are held together by bolts in a cast frame. Two end plates, reinforced by radial arms, render impossible any vibration of the frame, so that the machine runs almost without noise even at full load.

The armature generates current at 5,000 volts, and is wound in micanite tubes, which have been subjected to an insulation resistance test at 10,000 volts. The tubes and the slots are of circular section. This secures a good insulation and at the same time the hysteresis and eddy current losses in the teeth are minimized.

The energy losses are as follows:

Power absorbed by armature copper	13,700 watts.	
" " " " core	13,100	"
" " " " teeth	9,100	"
" " " excitation	13,800	"
Total	49,700 watts.	

The electric efficiency is therefore 95.3 per cent. at full load (non-inductive).

Special attention has been given to secure a small drop in voltage between full and no load. It is about 6 per cent for non-inductive load. This result is attained by a strong magnetic field and high saturation of the magnets. The short-circuit current is about 3.5 times the current at full load for a constant excitation.

The magnetization of the iron is always beyond the bend of the curve.

The method of arranging the measuring instruments is patented by the Messrs. W. Lahmeyer & Co., Limited.

This arrangement excludes any possibility of an accident to anybody in proximity to the instruments, as all readings are taken off a low tension circuit.

In each phase, one of the armature coils is separated from the others and is connected with the primary windings of a special transformer (ratio of windings 1 : 1), the secondary windings of which are in series with the rest of the coils. All readings are taken, in the primary windings, the amperes in these being the same as in the machine. The voltmeter is calibrated so as to give the voltage of the one coil multiplied by the number of coils, thus giving the voltage of the dynamo.

This arrangement gives very exact readings, and the difference of the air space at the different coils does not influence in any appreciable way the accuracy of the readings. This patent has been applied to many machines built by the Messrs. W. Lahmeyer & Co., Limited, and has given entire satisfaction.

The shaft of the combined set is made in three pieces coupled together by ordinary flanged couplings. The exciter armature is wound on the end of the shaft, which extends beyond the extreme bearing on the three-phase side of the set. The exciter fields are bolted to a bracket, fitted to the pedestal.

As we have seen above, a direct current dynamo (see Fig. 1) is coupled to the engine shaft on the other side; this dynamo is built for a normal capacity of 400 kw. at 500 volts and 94 revolutions per minute.

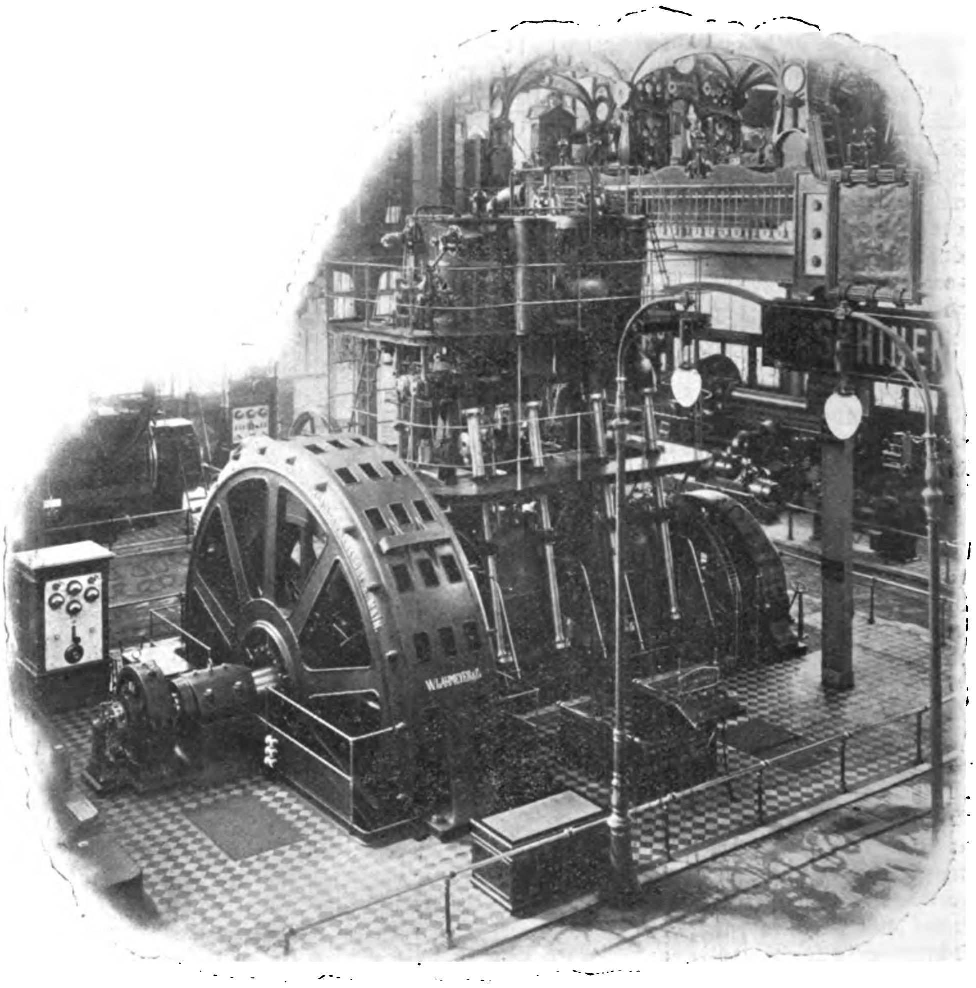

FIG. 1.

The dynamo is of the multipolar type. The yoke consists of two semi-circular parts on which twelve cast steel poles are held each by two iron bolts. The poles and pole pieces are cast in one piece (see diagrams Fig. 4 and 5).

The armature is of the drum type, and is bar wound in two layers in 609 milled slots, which are insulated with mica. The armature is not banded in the ordinary way, but the conductors are secured on small brass strips, which are held on the periphery by pins. At the back end of the armature all connections are in a piece with the conductors, the bars having been bent on a special former, so that the number of sweated joints is reduced to a minimum. The method of fixing the winding by these strips facilitates removal of a damaged bar. The commutator is built up of cold drawn copper segments with mica insulaton.

The brush connections are fixed on an I shaped ring, and are well insulated by ambroine. All screws of the brush holder which can possibly

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be gotten at from the outside are protected by caps of the same material.

This machine has been designed for traction work, and is specially adapted for severe overloads and sudden variations of the load, without sparking of the commutator. Even at 440 volts (the pressure used at the Exhibition) no rocking of the brushes is necessary.

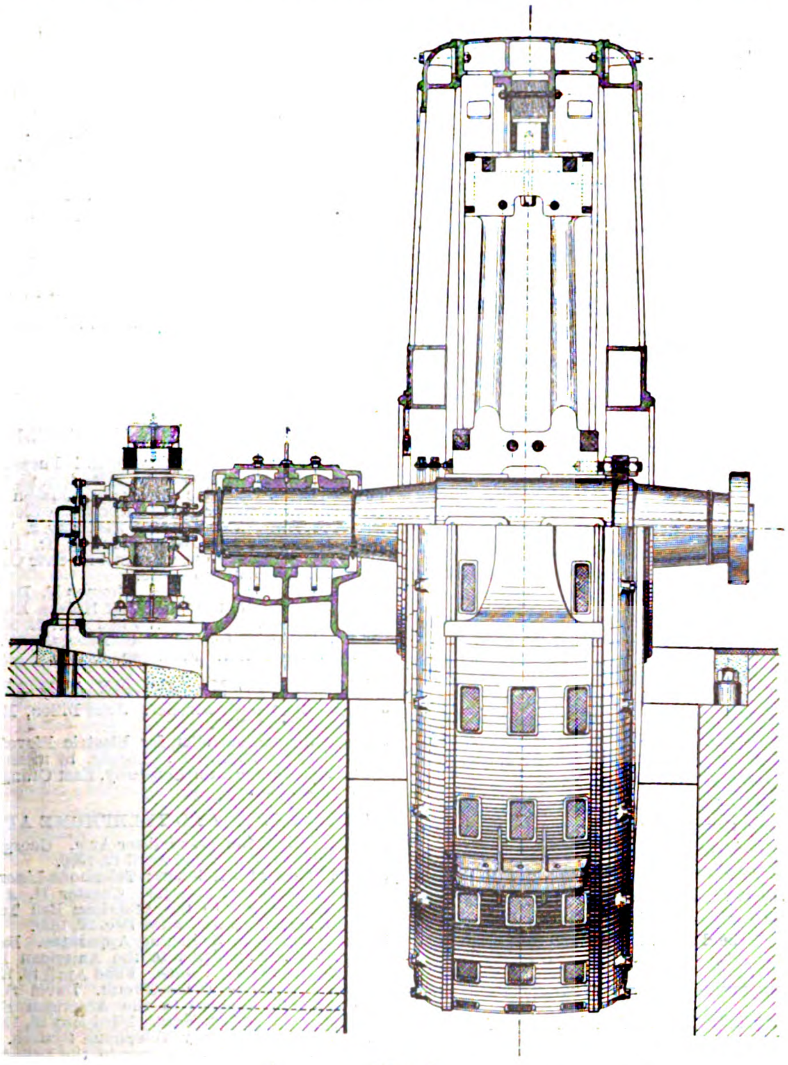

FIG. 2.

power absorbed by the armature copper is 2 per cent., by the excitation 1.5 per cent. There is very little heating, the rise in temperature being only 30° C for the armature iron, and 25° C for the induction coils.

The saturation of the iron is such as to give (at constant excitation) a difference in voltage of 10 per cent. only, between full and no load.

700 revolutions). This switch pinion engages itself automatically as soon as the machine is started.

The steam engine was supplied by the Maschinenbaugesellachaft Nürnberg. It is a vertical, 2-crank engine and develops 1,700 ihp., or 1,500 ehp. at 10 atm. (147 lbs. per square inch). The engine is provided with a jet condenser. It is bolted to a bed plate which consists of two parts. Each part is cast in one piece with 8 bearings. The shaft has a coupling at both ends for connection with the dynamos.

Diameter of high pressure cylinders 865 mm. (34 1-16 inches); diameter of low pressure cylinders 1,350 mm. (53½ inches).

Stroke 1,100 mm. (43 5-16 inches).

The two air pumps are driven from the connecting rod by means of a beam, diameter 670 mm. (26⅜ inches).

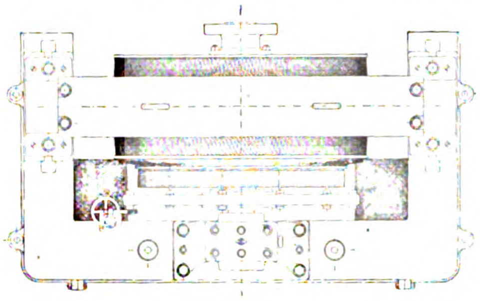

FIG. 4.

Stroke 350 mm. (13¾ inches).

The approximate weights are as follows:

Steam engine....	120 tons.
Three-phase dynamo.........	124 "
Direct current dynamo.......	31 "
Total weight..............	275 tons.

At the Exhibition the oil is supplied by the Vacuum Oil Company of New York. Many difficulties were experienced during the transportation, because of the three-phase dynamo. The way in which these difficulties have been overcome, is graphically illustrated on the annexed figure.

In consequence of the high pressure at which current is generated in the three-phase machine, many very distant points in the Exhibition are illuminated by its agency, for instance, the Alexander Bridge and the Main Portal of the Exhibition.

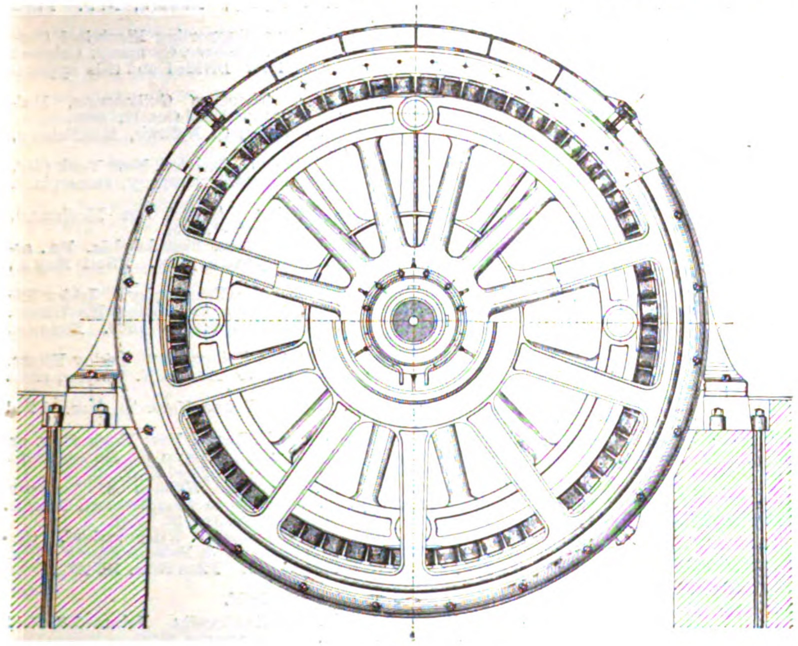

FIG. 3.

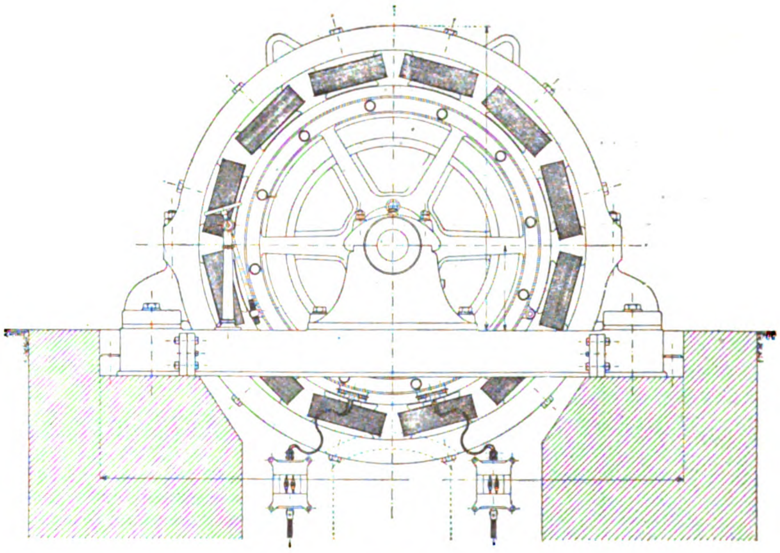

FIG. 5.

The diameter of the armature is 1,400 mm. (55 inches), its length 400 mm. (15¾ inches).

At full load and 530 volts the mechanical and electrical efficiency is 93.2 per cent. The

For starting the engine the following arrangement has been devised. A toothed disk has been placed on the shaft which is engaged by a small pinion driven by a 7 hp. motor (230 volts,

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The International Electrical Congress.

The International Electrical Congress was opened at Paris Saturday, August 18, in the Palace of Congresses. The United States, France, Germany, Italy, England, Russia, Hungary, Austria, Belgium and Switzerland were well represented. Addresses were delivered by M. Goumeux and Prof. Mascart. The following permanent officers were elected :

President, Prof. E. E. N. Mascart; secretary, Prof. Paul Janet; reporter, Prof. E. Hospitalier; vice-presidents, France, H. Moissan, H. Fontaine and E. Gariel; United States, Carl Hering and A. E. Kennelly; Germany, F. Kohlrausch and Dorn; Great Britain, Sir W. H. Preece and Prof. John Perry; Italy, Prof. Colombo; Belgium, Prof. Eric Gerard; Austria, Max Jullig; Hungary, Etienne de Fodor; Russia, Prof. Chatelain; Switzerland, Mr. Turrettini.

The Congress was divided into five sections as follows: Section I, Scientific Methods and Measuring Instruments; Section II, Electrical Generation, Transformation, Transmission and Distribution, Electric Lighting and Traction; Section III, Electro-Chemistry; Section IV, Telegraphy, Telephony and Miscellaneous Applications; Section V, Electro-Physiology.

During the Congress papers on the following subjects were read: "Cost of Current for Electric Railways," by Mr. Postel-Vinay, "Concerning the Construction of Dynamo-Electric Machines," Maurice Leblanc: "Excitation of Induction Machines," Maurice Leblanc; "Utilization of Condensers," P. Boucherot: "Converters and Rectifying Transformers," P. Janet; "Summary of the Decisions of Former Congresses," E Hospitalier; "Actual Condition and Progress of Telegraphy Without Wires by Hertzian Waves," André Blondel and Gustave Ferrié; "The Electric Furnace," Mr. Keller; "Behavior of Alternators Connected in Parallel," G. Chevrier; "Precise Measurements of Alternating and Polyphase Currents," G. L. Addenbroke; "Photometry," J. Violle; "Concerning Electromagnetic Mechanisms, Silvanus P. Thompson; "Electrochemical Deposition," Henry Bouilhet; "Progress in Electric Lamps," André Blondel.

During the Congress an opportunity was afforded the delegates to visit the various electrical undertakings of interest in the neighborhood.

The following members of the American Institute of Electrical Engineers were present and took part in the discussions: Carl Hering, A. E. Kennelly, C. O. Mailloux, W. J. Hammer, Captain John Millis, U. S. A.; W. D. Weaver, B. J. Arnold, V. R. Lansingh, J. M. Hollister, I. R. Edmonds, A. Oolgaardt and Prof. F. B. Crocker.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended September 5:

Antwerp, 45 packages, $5,608; Argentine Republic, 339 packages, $783; 15 motor cars, $26,050; 167 cases, $20,656; Australia, 20 cases, $520; Berlin, 3 cases, $775; 3 crates automobiles, $381; British East Indies, 6 cases, $1,150; 6 packages, $1,000; British Guiana, 2 packages, $250; British West Indies, 10 packages, $475; Brazil, 27 packages, $1,026; Brussels, 2 cases, $390; Central America, 30 packages, $380; Chili, 2 cases electric belts, $250; 35 packages, $1,536; China, 5 barrels, $200; Cuba 40 cases, $783; 1 case motors, $15; Dundee, 1 case, $133; Ecuador, 2 packages, $38; Glasgow, 43 cases, $17,705; 70 reels electric cable, $13,454; Hamburg, 102 packages, $3,430; 25 cases, $8,280; Havre, 150 cases, $5,072; 1 package, $20; Hong Kong, 21 packages, $392; Japan, 65 cases, $3,150; 166 packages, $3,042; Liverpool, 49 cases, $18,280; 75 trolley poles, $2,200; London, 206 cases, $15,465; 47 cases motors, $6,364; 25 reels electric cable, $4,072; 150 trolley poles, $4,400; Manchester, 1 box motors, $172; Marseilles, 12 boxes, $65; 2 packages motor trucks, $930; 3 cases, $719; Mexico, 6 cases, $105; Moscow, 4 cases, $272; Naples, 3 cases, $806; Newcastle, 1 case, $4; New Foundland, 7 packages, $180; Nova Scotia, 1 box, $20; 1 case motors, $25; 26 packages, $260; Peru, 4 cases, $1,226; 9 packages, $187; Philippines, 2 packages, $30; Rome, 1 case, $20; Southampton, 29 cases, $2,869; 2 cases automobiles and parts, $2,775; U S. Colombia, 5 packages, $44; Venezuela, 38 cases, $390.

PERSONAL MENTION.

Mr. Harold Winthrop Buck, of New York City, was lately appointed electrical engineer for the Niagara Falls (N. Y.) Power Company and its allied interests, including the Buffalo and Tonawanda companies.

Mr. F. B. Fish, of Dayton, O., has been engaged by the Big Fork Electric Power Company of Helena, Mont., to plan and superintend the erection of its plant down at the falls of the Big Fork River.

Mr. Arthur H. Ford has been elected to the ad interim instructorship in electrical engineering at the University of Colorado, to take the place of Prof. George H. Rowe, who has been given a leave of absence for one year.

Mr. L. B. Stillwell, formerly electrical director of the Niagara Falls Power Company, will remove to New York City, where he will take full charge of the equipment of the electric railways of the Manhattan Railway Company.

Mr. George F. Sever has been assigned the task of arranging the multitudinous details in the development of the electrical exhibits at the Pan-American Exposition at Buffalo, N. Y.

COMING ELECTRICAL EVENTS.

American Electro Therapeutic Association—Will meet in New York City Sept. 25-27, 1900.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

National Association of Municipal Electricians—Will meet in Pittsburg, Pa., Sept. 25-27, 1900.

Old-Time Telegraphers' Association and the U. S Military Telegraph Corps—Will meet in Minneapolis, Minn., Sept. 18, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

Street Railway Association of the State of New York—Will meet at Buffalo Sept. 18-19, 1900.

INCORPORATIONS.

The Citizens' Electric Company, Clinton, Ill. Capital stock, $15,000. Incorporators: E. S. Nixon, T. Hinchliff and W. W. Newman.

The Cook Electric Company, New York City. Capital stock, $10,000. Directors: S. S. Cook and Martha A. Cook of Long Island City, David Mason of New York City.

The Leadville Gas & Electric Company, Leadville, Col. Capital stock, $200,000. Incorporators: John F. Champion, Robert B. Sullivan, Gilbert Wilkes and C. K. Boettcher.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED SEPTEMBER 4, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

657,132. Trolley-Track. Theodore C. Prouty, Midland, Mich. Filed June 5, 1900.

657,166. Elevated Trolley-Way. Edward C. Jones, Kansas City, Mo., assignor of one-half to Annie Means Morgan and Arthur G. Barnhart, same place. Filed Sept. 19, 1899.

657,170. Automatic Railway Signal-System. Jacob W. Lattig, West Bethlehem, Pa. Filed June 6, 1900.

657,180. Car-Fender. Richard F. Preusser, Washington, D. C. Filed Nov. 20, 1899.

657,213. Trolley. Joseph E. Connolly, Newark, N. J. Filed Dec. 5, 1899.

657,311 657,484. Closed-Conduit Electric Railway. Leon Dion, Boston, Mass. Filed March 6, 1899.

657,330. Electric Railway. Theophilus P. Chandler, Philadelphia, Pa. Filed July 27, 1900.

657,342. Trolley-Catcher. Frank J. Fairchild, Wyandotte, Mich. Filed Oct. 12, 1899.

657,487. Electric Railway System. Emmerich Frischmuth, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Feb. 12, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

657,199. Electric Lamp for Dental Purposes. Byron E. Lawton, Providence, R. I. Filed Oct. 23, 1899.

657,432-657,433. Electric-Arc Lamp. Joseph Melzer, Cleveland, O., assignor to the Interstate Electric Company, same place. Filed April 2, 1900, May 2, 1900.

657,450. Electric-Arc Lamp. Irving R. Prentiss, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 15, 1899.

657,485. Electric Arc Lamp. Thomas E. Drohan, Chicago, Ill., assignor to the Siemens & Halske Electric Company of America, same place. Filed Aug. 26, 1899.

657,502. Support for Electric Lamps. Willis A. Swan, Providence, R. I. Filed Jan. 6, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

657,159. Rheostat-Controller. John Dillon, Milwaukee, Wis. Filed June 4, 1900.

657,416. Speed-Controller for Electric Elevators. John D. Ihlder, Yonkers, N. Y., assignor, by mesne assignments, to the Otis Elevator Company, East Orange, N. J. Filed Nov. 27, 1897.

TELEPHONES AND TELEPHONE APPARATUS.

657,288. Telephone Transmitter-Arm. George R. Kennedy, Allegheny, Pa. Filed April 12, 1900.

657,305. Means for Relieving Telephone-Lines from Deleterious Electrical Charges. Chester H. Arnold, Boston, Mass., assignor to the American Bell Telephone Company, same place. Filed Dec. 22, 1899.

657,315. Telephone Switching Apparatus. David S. Hulfish, Chicago, Ill., assignor to the American Bell Telephone Company, Boston, Mass. Filed April 12, 1900.

657,316. Telephone Trunk-Circuit. David S. Hulfish, Chicago, Ill., assignor to the American Bell Telephone Company, Boston, Mass. Filed May 25, 1900.

657,338. Central-Battery Telephone System. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard & Supply Company, same place. Filed April 28, 1899.

657,339. Plug and Socket for Telephone Systems. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard & Supply Company, same place. Filed April 28, 1899.

MISCELLANEOUS.

657,090. Pneumatic-Despatch-Tube Apparatus. James T. Cowley, Lowell, Mass., assignor to the Lamson Consolidated Store Service Company, Newark, N. J. Filed March 23, 1999.

657,104. Method of Stringing or Supporting Electrical Conductors. Louis Hackethal, Hanover, Germany. Original application filed Dec. 20, 1898. Divided and this application filed April 20, 1900.

657,196. Submarine Cable. Theodore Guilleaume, Mulheim-on-the-Rhine, Germany. Filed Oct. 19, 1899.

657,202. Electric Furnace. Henry C. McBrair, Middletown, N.Y. Filed May 18, 1899.

657,211. Electric Lock. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Jan. 13, 1900.

657,218. Submarine Apparatus. August von Hoffmann, Munich, Germany. Filed Dec. 31, 1898.

657,221. Static Relay. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899. Renewed March 17, 1900.

657,222-657,224. Wireless or Space Telegraphy. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899, Sept. 18, 1899. Renewed March 12, 1900.

657,223. Receiving Device for Telegraphy. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed May 20, 1899.

657,280. Phonograph. William Bohne, Toronto, Can. Filed March 20, 1900.

657,359. Thermostat. Henry E. Reeve, New York City, assignor to the Automatic Fire Alarm & Extinguisher Company, Limited, same place. Filed Nov. 15, 1899.

657,378. Roentgen-Ray Apparatus. William S. Andrews, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 20, 1898.

657,414. Fuse. Rudolf Hundhausen, Wilmersdorf, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Nov. 18, 1899.

DESIGN.

33,177. Switch-Lever for Electric Circuits. Edward S. Baldwin, Peabody, Mass., assignor to the Boston Pump Company, Boston, Mass. Filed July 16, 1900. Term of patent 14 years.

REISSUE.

11,852. System of Train Control. Edwin W. Rice, Jr., Schenectady, N.Y., assignor to the General Electric Company of New York. Filed March 16, 1899. Original No. 608,301, dated Aug. 2, 1898.

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THE TELEPHONE WORLD.

President Eckert Explains.

The Knickerbocker Telephone & Telegraph Company, recently incorporated under the laws of the State of New York, has filed a mortgage for $5,000,000 on all its property, franchises and telegraph and telephone lines in this city and elsewhere that have been constructed or are to be completed. The mortgage was made in favor of the City Trust Company, and is given to secure an issue of 5,000 gold bonds of $1,000 each, payable in fifty years from September 1, 1900, with interest at 5 per cent. per annum.

The mortgage was executed by William H. Eckert and Arthur Phillips, as president and secretary, respectively, of the company.

Referring to the subject, Mr. Eckert said that the mortgage was without special significance and that it was intended to cover the rights and property of the company, so as to facilitate as far as possible the construction of its plant.

"We are going ahead with the work," said Mr. Eckert, "as quickly as possible, and are making favorable progress. It will probably take fully a year, however, to get all of our lines laid and in full operation. Although we have been at work now only about five months, we have our lines laid all over Queens, and we have done much work in the Bronx and in Manhattan. In Nassau, also, we have laid many lines.

"We do not contemplate any change in our plans as originally announced, and, all reports to the contrary, we are going right ahead with our work and will push it to completion at the earliest possible time.

"We have done little advertising and mighty little talking, but the work of laying our lines is being pushed all the time. The only difficulty we may experience may be in getting materials quickly enough.

"Our lines in Manhattan are not widely placed as yet, but in Queens, as far as the trunk lines are concerned, the work is almost complete. We will go ahead with the work in Manhattan as quickly as we can get the material we require.

"The Knickerbocker Company is an assured fact. It is here to stay. It is the only attempt at competition since the inception of the telephone, and we believe the public will appreciate it. We are already operating our Broome street and 23d street exchanges, though with a limited number of subscribers, and so may say we are a full-fledged working company. The work of testing cable is going on all the time and we mean to have everything up to date. We have experienced no special trouble in getting rights of way. We are asking for nothing that we are not entitled to.

"There is absolutely no truth in the reports that have been circulated to the effect that we are in the hands of a receiver and are not paying our bills."

The Union Telephone Company.

The Union Telephone Company of Plainfield, Wis., is one of the most flourishing of the small independent companies scattered throughout the country. The company was organized two years ago with B. B. Borden, president, and Frank R. Borden, vice-president. The company by furnishing good service at low rates has gradually built up its business until now it operates three exchanges, with no less than eight separate farmers' lines, and controls some 200 miles of toll line in five counties. The farmers' lines are quite popular, the farmers finding them a very great convenience in learning market prices and the probable state of the weather, the company telephoning the weather report to the farmers every morning. The regular subscriber rate is $8 a year, which is the lowest rate in the State of Wisconsin, and which goes to prove that a company can furnish excellent service for a price within the reach of all, notwithstanding statements to the contrary by some of the Bell companies. An official of the Union Telephone Company states that the cost of building the lines does not exceed $25 a mile, including poles, wire work and in fact everything pertaining to the line. The company would be pleased to hear of anyone building a good, durable line such as is owned by that concern for less money per mile.

According to the managers of the Binghamton (N. Y.) Telephone Company they expect to start the erection of the poles in that city shortly. The work done thus far has been confined to securing additional subscribers to the already large list. The question of getting a building centrally located is the main drawback to the work, and until that is done not much progress can be made with the work of installing the plant.

The Citizens' Independent Telephone Company has been organized at Oklahoma City for the purpose of constructing and operating an independent telephone system at that place. The capital stock of the company is $60,000.

A telephone line between Mountain View and Cordell, the new county seat of Wichita County, Kan., is proposed.

The Richmond Telephone Fight.

Another stage in the litigation so long drawn out between the city of Richmond, Va., and the Southern Bell Telephone Company was reached a few days ago when the latter corporation secured an appeal and supersedeas from the recent decision of the United States Circuit Court of Appeals.

The case now goes to the Supreme Court of the United States, and will be placed on the docket of the October term.

In its assignment of errors, filed with its petition for an appeal and supersedeas, the telephone company contends that twenty-one errors were committed by the Circuit Court of Appeals, and contends, among other things, that its lines were constructed under authority of statutes of the Commonwealth, with consent of the council of the city of Richmond, given by its ordinance of June 26, 1884, and that the city council did not by this ordinance (and could not as the State statutes then stood) reserve the right to require the removal of telephone lines from streets, upon which they might be constructed prior to a repeal of this ordinance.

The telephone company also contends that by section 1290, of the Code of 1887, the Legislature of Virginia took from the council of the city of Richmond all power (if any existed prior to that time) of repealing or revoking the right of the telephone company to maintain and operate its lines upon streets where they have been constructed by consent of the city council and upon streets designated by the committee on streets under the city ordinance of 1881.

The telephone company, therefore, claims that when relying upon the State statutes and city ordinance of 1884, it expended money and constructed its lines, a binding contract arose between the telephone company and the Commonwealth, as well as between the telephone company and the city of Richmond, protected by the Constitution of the United States, the validity of which cannot be impaired by any subsequent municipal legislation, and that the ordinances of the city of Richmond seeking to revoke all rights of the telephone company and requiring the removal of its lines from the streets of the city of Richmond, violate the vested rights of the company and violate the Constitution of the United States, which gives the telephone company the right to appeal to the Supreme Court of the United States, and to ask for the reversal of the decision against it for each of the twenty-one reasons stated in its assignment of errors.

The project for a new telephone company in Louisville, Ky., is beginning to take definite form. Mr. Robert E. Woods, who is the attorney for the promoters of the new company, referring to the subject recently said: "This movement is an earnest, genuine enterprise. The new company will start with a large number of subscribers, the rates will be very low and the service quick. There will be no such thing as two and three subscribers on one line, and there will be no pay stations, except at the hotels, for the use of strangers. Several other cities have recently opened the way for competing companies and everywhere it has proved a success." It is generally believed the council will grant a new franchise.

P. F. McClure of Pierre, S. D., has opened telephone connections with his breeding ranch several miles down the river from that place by attaching a wire from the city exchange to a barb wire fence along the railroad track, and making crossings by a small insulated wire laid in a gas pipe under the roadway. No effort was made to insulate the barb wire on the railroad fence, but the 'phone works as well as others on the system which are insulated.

Evan Shelly, of Lafayette, Ind., has invented a pocket telephone for use by police departments in larger cities. It consists of a receiver and transmitter, weighing altogether less than 17 ounces. By inserting a small plug in a little box attached to a telephone pole, automatic connection with the central office is secured. Tests between Indianapolis, Crawfordsville and other points demonstrate its practicability. Mr. Shelly is manager of the Lafayette Telephone Company.

The Union Telephone Company's line from Spartansburg, to Corry, Pa., has just been completed, and poles are in place for a line to Erie, Cleveland and several hundred towns in Ohio and northwestern Pennsylvania, as well as Greenville, Mercer and the entire system of the Mercer County Independent Telephone Company. Within a short time it is expected that the circuit will include Titusville, Oil City, Bradford and Kane.

The Schuylkill (Pa.) Telephone Company will introduce the central energy system. By this system it isn't necessary to ring for the exchange, but taking the receiver from its position calls up the exchange.

A Free Telephone.

The American people, says the "Globe" of St. Paul, Minn., have long been inquiring when that great agency of personal information, the telephone, would be made available for general use as a public agency. They have seen the invention outlive the operation of the patent laws, without any sign that the discovery would be made available for public use, save as the medium for enrichment of those engaged in its operation. Nor have they been able to discover any enduring signs that the invention would be restored to public ownership for many years to come.

Recently an experiment has been made of the use of a free telephone. It was in an inconsiderable town in Wisconsin. A free telephone station was established, placed in a prominent position, and the public invited to use it without let or hindrance. The result is accepted as a test of the utility of free telephone service, although it was an entirely unjust and partial one.

The telephone company, at the suggestion of the mayor of the community, established a free public station. It was placed in a booth at the intersection of two principal streets, on the sidewalk. At night the booth was lighted with electricity. Its interior contained nothing but a card of the subscribers and the instrument. Two or three months after the experiment was inaugurated it was declared to "have proved a popular success from the start."

But the sequel was not satisfactory. While the company's list of subscribers was increasing with remarkable rapidity, and the increase was generally regarded as due to the increased value of the telephone service to merchants by reason of the number of people with whom the free telephone brought them in communication, three months later the experiment was abandoned as a failure.

The reason for the failure, as declared by the company and the merchants was the abuse of the free service by certain irresponsible members of society who abused the privilege offered to them. "Youngsters and irresponsibles" had defaced the booth and used the instrument "recklessly and viciously, making telephone calls for mischief and worse."

The independent telephone companies are at present actively engaged in constructing lines in Clare, Mich., and vicinity, and very soon their service will be complete in every respect. The Union Company has completed its line from Clare to Farwell, connecting there with the Citizens' for Evart, Reed City and Ludington. Poles are being set for the line to Harrison, and later in the season a line will be built to Coleman, Midland and Bay City. Its lines are all full metallic and the public seems pleased with the service given. Clare will soon be the most important switching point in that section of the State for both the independent and Michigan lines.

The Virginia & Tennessee Telephone Company has made a conditional sale of its exchange and lines to the Wytheville (Va.) Telephone Company, the terms of which have not yet been made public. It is understood that if the service of the latter is satisfactory to the subscribers for one month, the sale will be consummated.

A Brockton, Mass., paper states that there is a rumor that the new telephone company, which was granted a franchise in that city, and which has since done nothing to indicate that it intends to avail itself of the opportunity given to build, may run up against a snag in the shape of a recommendation from the mayor that the franchise be repealed.

Work on the telephone line between Las Animas, Col., and La Junta was begun recently. The work has been delayed for some time owing to the inability of the promoters to secure suitable poles. When the line is completed Las Animas will be put in connection with every point touched by the Colorado Telephone Company's wires.

John I. Sabin, president of the Pacific Telephone & Telegraph Company, at San Francisco, Cal., has notified the board of supervisors of that city that sixty-three telephones now used by the police and fire departments will be discontinued. This action is the result of the appropriation for telephones having been cut from $15,000 to $7,000.

Arrangement has been made by which Kountze, Tex., will be connected with the outer world by a long-distance telephone.

TELEPHONE INCORPORATIONS.

The North Conway Telephone Company, North Conway, N. H.—to establish a telephone service. Capital stock, $5,000. Incorporators: C. E. Gibson, C. E. Poole, J. Z. Shedd, D. W. Barnes, A. Eastman, all of North Conway.

The Staunton Telephone Company, Springfield, Ill. Capital stock, $2,500. Incorporators: C. R. Wall, S. P. Williamson and C. Godfrey.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Alliance, O.—City Engineer O. W. Pfouts is preparing plans and specifications for the new electric lighting plant.

Auburn, N. Y.—Arrangements are being made to have the overhead wires in this city removed and placed underground.

Barton Heights, Va.—This town will soon be brilliantly illuminated with electric lights. Bids will be asked from the Virginia Electric & Construction Company and the Richmond Passenger & Power Company.

Bay City, Mich.—An ordinance has been favorably reported to the city council giving to the Traction & Power Company of this city a franchise to erect an electric lighting system. The company is supposed to be the Consolidated Street Railway Company.

Bettsville, O.—The citizens of this place are talking of putting in electric lights.

Bronson, Mich.—This place expects soon to have a new $10,000 electric lighting plant to be put in by a private company.

Buffalo, N. Y.—The new electric light company has leased the power house of the street railway company for ten years. It will put in additional machinery and supply the railroad company with power, besides furnishing the arc lights for street lighting, and incandescent lights for commercial use. The service will commence November 1st.

Connellsville, Pa.—The Meyersdale Light, Heat & Power Company was sold recently for $20,000. The principal stockholder in the new company is Joseph Wolf of Braddock.

Crisfield, Md.—The Crisfield Ice Manufacturing Company has been granted a franchise to establish an electric light plant.

Ft. Scott, Kan.—The city council has decided to erect an electric light plant.

Hill City, Tenn.—The citizens of this place are agitating the question of building a new municipal electric light plant.

Houston, Tex.—The mayor of this city has decided to re-advertise for bids for building the electric light plant.

Kirkwood, Mo.—The building recently purchased by this town for an electric light plant, burned to the ground a short time ago. The fire will delay this considerably as a new building will have to be erected.

Macon, Ga.—The chamber of commerce is considering the question of municipal ownership for the electric light plant. G. A. Smith, president.

Madison, Neb.—This place is arranging to have an electric light plant.

Missoula, Mont.—This place is to have an electric light plant in the near future.

Monroe, Ind.—The board of trustees has decided to erect an electric light plant here.

Norman, Okla.—The city council will soon receive bids for lighting this town.

Olcott, N. Y.—This place will be lighted by electricity as soon as the electrical power plant at Newfane can supply the necessary current.

Portland, Me—The Portland Railway & Terminal Company will erect an electric light plant to cost $100,000.

Richmond, Ind.—The municipal electric light plant for this city will be a reality in a comparatively short time.

Roanoke, Ill.—The electric light plant lease has been bought by William Harting who will conduct the light franchise.

Shamokin, Pa.—The Shamokin-Edgewood Electric Light & Power Company was lately granted a charter. The company will build its plant within the next thirty days.

Shawano, Wis.—The citizens of this place recently voted by a majority of 232 in favor of putting in electric lights and waterworks.

Spencerville, O.—Bids will be received until September 15 for the erection of a municipal electric lighting plant at this place.

Syracuse, N. Y.—An electric plant will be installed in the St. Cloud Hotel, which will furnish electricity for many buildings in the same block.

Tarrytown, N. Y.—The new managers of the Hudson River Gas & Electric Company are improving the whole plant at this place.

Trinidad, Col.—This city is agitating the establishment of a municipal electric light plant.

Vineland, N. J.—The borough council has advertised for bids for the new municipal bond issue for $25,000 for an electric light plant.

Weiser, Idaho.—The board of trade is circulating a petition for a special election to vote on the question of issuing bonds for erecting an electric light plant.

West Branch, Mich—W. W. Vaughn will construct a dam and erect an electric light plant to furnish power to manufacturing plants in this vicinity.

Westerly, R. I.—C. B. Cottrell & Sons Co. of this town has awarded the contract for a new electric light plant to the New England Engineering Company of New London.

Windber, Pa.—A new electric light plant to cost $25,000 will be built here.

Windsor, Mo.—S. W. Garver will build the new electric light plant at this place.

Youngstown, O.—Options on the Youngstown Gas & Electric Light Company were recently closed by New York and Chicago capitalists and the transfer is to be made October 1. The consideration is half a million dollars.

STREET RAILWAYS.

Akron, O.—An electric street railway is to be built between this city and Canton. T. L. Childs of this city is the chief promoter.

Harpswell, Me.—At a recent meeting of the citizens of this place Eli Alexander, Samuel Dunning and T. E. Skolfield were appointed a committee to see how much money could be raised towards building an electric railroad from Brunswick by New York promoters. The meeting was unanimously in favor of the road and a New York company proposes to put one in if the Harpswell people will subscribe for enough stock.

Hudson, N. Y.—The Albany & Hudson Railway operated by the third-rail system, was opened to passenger traffic on September 6.

Huntington, W. Va.—The Ohio Valley Electric Railway Company has been incorporated with $1,000,000 capital stock to construct a street railway line from this city to Ironton, O. T. J. Ryan and H. S. Calo of this city are interested.

Ithaca, N. Y.—The proposed trolley road from this place to Auburn seems to be assured and the plans are assuming definite shape.

Jersey City, N. J.—Arrangements were made last week by Government officials with the officers of the North Jersey Street Railway Company by which trolley service will be utilized to transfer the mails between here and the towns in the northern and southern parts of Hudson County.

New Albany, Ind.—The New Albany Street Railroad Company has been granted a franchise to build, equip and operate an electric line.

Orange, Mass.—There is considerable interest in this town, and also in Wendell, Erving and Farley, in the proposed new electric railroad from here to Miller's Falls, constituting the connecting link from Greenfield to Boston after the Athol & Templeton road is completed.

Pana, Ill.—A recent conference, held between the promoters of the proposed Hervey City & St. Louis Electric Railway and the Business Men's Association, resulted in the appointment of a committee of citizens to investigate the matter, secure the right of way through the township, and raise the necessary bonus.

Philadelphia, Pa.—Fire destroyed the entire plant of the Philadelphia & West Chester Traction Company at Llanarch, which is about seven miles from this city.

Prospect, O.—An electric railway is to be built between Marion and this place.

Richmond, Ind.—It is said to be a settled thing that the two proposed electric railroads out of this city, for which franchises have been granted, will not be built before next spring.

Smethport, Pa.—A charter was recently issued by the State Department at Harrisburg to the Smethport Electric Street Railway Company of this place with a capital of $12,000.

Spokane, Wash—E. F. Gilpin has recently been in Spokane to complete arrangements to build an electric tramway 50 miles long from Grangeville to Buffalo Hump.

Two Rivers, Wis.—H. C. Higgins of Marinette, and Thomas Higgins, expect soon to have the franchises for an electric line between here and Manitowoc. They will build it as soon as they secure the rights of way.

MANUFACTURING.

Chicago, Ill.—A concern to manufacture electrical machines and appliances was recently organized here under the name of the Advance Machine Company, with a capital of $2,500. B. M. Davis, G. C. Travis and J. F. Larson, all have an interest in the firm.

Jersey City, N. J.—The Laconia Manufacturing Company was lately formed here to do a general electrical business, with a capital of $500,000. Among those interested are G. B. Morton, W. H. Carey, C. Sickelman, all of Jersey City.

Louisville, Ky.—The Central Electric Company, with $10,000 capital stock, in which J. S. Carill, B. M. Gelatt and W. C. Hines are interested, will manufacture electric supplies.

West Point, Ga.—The West Point Iron Works of this city wants a second-hand dynamo, about 25 lights.

COMPANY MATTERS.

Newark, N. J.—Papers increasing the capitalization of the Electric Enameling Company from $250,000 to $1,000,000 were recently sent to the Secretary of State. The head of the company, Charles H. Waterman, has patented a process for enameling electrically tiling, brick and all kinds of metals. It is the company's intention to build a factory in New Jersey soon.

San Antonio, Tex.—The Dubinski Electric Company of this city lately filed a deed of assignment in the county clerk's office.

POWER AND TRANSMISSION PLANTS.

Denver, Col.—The Telluride Power Transmission Company is building an addition to its plant, which will make it the largest electric plant in this State. Several mines in Ouray will be supplied with power from this plant, among them the Camp Bird, which, by the first of next year, will be equipped with a complete electrical plant, including electric drills, electric locomotives with a capacity for hauling 50 tons of ore, and electric motors for the operation of the mill. Everything about the mine and mill will be operated by electricity.

Gering, Neb.—A. L. Searles, of Chicago, is in this city for the purpose of furnishing plans and estimates for the proposed electrical power plant to be erected here.

New York City.—The Heniskayuna Power Company of this city was lately organized, to develop hydraulic and electrical power, on a capital of $100,000. Ernest C. Brown and L. J. Montgomery, of New York City, and W. A. Graves, of Rexford Flats, are interested.

MINES.

Colorado Springs, Col.—Lessee Baldwin has ordered an electric hoist to assist him in his development scheme. The company's workings on this property recently encountered one of the greatest ore bodies of the district, and the lessee believes his end to be equally prolific.

Walsenburg, Col.—M. D. Murray, superintendent of the McMillan mines at Sierra Blanca, lately completed arrangements for putting in an electric plant on the properties over which he has charge.

AUTOMOBILES.

Detroit, Mich.—At a meeting of the executive committee of the National Association of Street Railway Employes, held here September 7, President Mahon was instructed to draft a plan by which the local unions are to be assessed for raising a fund with which to purchase automobiles for use by the street railway men in the cities where the street railway men's strikes are in progress.

Philadelphia, Pa.—A charter was recently issued to the Automobile Construction Company of this city with a capital stock of $5,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.– Sept 10						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000 000	1⅛ % Q.,	121	121½
Allentown Pa.– Sept 10						
Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn– Sept 10:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md–Sept 10						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.– Sept 10						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co.......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	144½	145
Brooklyn N. Y.– Sept 10;						
Brooklyn City Ry	100	2,000,000	1,928,400	....	282	284
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	55⅛	55⅜
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.	100	2,000,000	1,884.200	2½ % Nov., '99.	322	325
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co.	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.– Sept 10.						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co.	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.–Sept 10.						
Columbus Street Railroad.	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.– Sept 10						
Charleston City Ry. Co.	50	100,000	100,000	3 % S.	--	--
Enterprise City RR. Co.	25	1,000,000	250,000	....	--	--
Chicago, Ill.– Sept 10						
Chicago City Ry. Co.	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99	250	255
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	80⅛	81
Met. West Side El., pfd	100	15,000,000	9,000,000	....	79⅛	80
North Chicago Street RR.	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry............com	....	1,250,000	624,900	35 %	17½	18
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.– Sept 10:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.–Sept 10.						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,000,000	3-5 % Jan.	100	101
Cleveland Electric Ry.	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.– Sept 10:						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry.	100	....	1,200,000	....	175	..
Rapid Railway Co.	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.– Sept 10.						
City Railway Co..............com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co..............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.–Sept 10						
Hartford Street Ry. Co.	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.– Sept 10						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.–Sept 10						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind– Sept 10.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.–Sept 10						
Pennsylvania Traction Co.	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry.....	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.–Sept 10 :						
Louisville Ry..................com.	100	4,000,000	3,500,000	1½ %., April.	78	79
Louisville Ry................... pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.–Sept 10						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68⅞
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.–Sept 10						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S., M. & N.	249	250
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¾ % S., J. & J. †	100¾	100⅞
Memphis Tenn.–Sept 10:						
Memphis Street Railway Co.	100	500,000	500,000	....	25	--
New Haven, Conn.–Sept 10:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	--
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.–Sept 10						
Canal & Claiborne RR. Co.	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1½ %. Oct.,	56½	57
New York–Sept 10:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	755	800
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	125
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	154½	154⅝
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR...........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110¾	111
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.–Sept 10 :						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57½	59
North Jersey Railway Co.	100	6,000,000	6,000,000	....	23	24
United Elec. Co. of New Jersey..	100	504,000	504,000	11½ % A.	18	19½
Pittsburg, Pa.–Sept 10:						
Allegheny Traction Co.	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co.	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co.	50	3,000,000	‖3.000,000	6 % A.	72¼	72½
r Duquesne Traction Co.	50	3,000,000	‖3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co...............com.	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co................pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for $145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Sept 10						
Union Street Railway Co	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass—Sept 10						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Sept 10.						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Sept 10						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Sept 10:						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Sept 10						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '19	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co......... $12½ pd	50	30,000 000	29,980,450	....	36⅞	37
*c*Electric Traction Co	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¼	98½
*j*Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
*j*Philadelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Sept 10						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Sept 10						
*j*Reading Traction Co	--	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	850,000	850,000	Jan., '98.	138	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Sept 10						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	--	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	--	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	--	--
United Electric Ry............com.	50	500,000	500,000	....	20	21
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Aug.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	375,000	$2.50 share, '96.	59	--
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Sept 10.						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
*m*Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16⅛	...
*m*Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Sept 10						
Springfield Consolidated Ry	100	750,000	750,000	....	----	--
Springfield O.—Sept 10						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Sept 10						
Springfield Street Ry	100	1,200,000	1,166,700	4 % A.	207	212
Toronto Canada.—Sept 10						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ‡	97⅛	97⅝
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Sept 10:						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Sept 10						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	30	31½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Sept 10:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 10						
American Bell Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	142	148
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	98
New England Telephone Co	..	10,394,600	10,304,600	$1.50 p. sh. Feb	123½	125
New York.—Sept 10						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co. guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	--	......	97,370,000	1¼ %, Q, Jan. '99.	79	80
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Sept 10.						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	120
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	...	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 10:						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	138¼	138½
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	28
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Sept 10						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	.	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co..........com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	138¾	138½
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Sept 10						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Sept 10						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	70	80
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	74	87
Northern Elec. Light & Power Co.	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Sept 10						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	2% Q ‡	201	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	181	182¾
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 96.	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Sept 10:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p. sh.	--	100
New York.—Sept 10:						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Sept 10						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	--	162
Welsbach Commercial Co.....com.	100	3,500,000	......	----	21½	21⅛
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	48	44
Welsbach Light Co., Canada.	5	500,300	......	....	1	1¼
Pittsburg, Pa.—Sept 10						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Sept 10						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	18	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	....	....	32	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	55	56
Johns-Pratt Co	100	....	....	----	105	109
*Pratt & Whitney Co..........com.	100	......	....	----	2	4
*Pratt & Whitney Co............pfd	100	....	......	----	40	50
Stillwell-Bierce Co.............com.	--	....	....	----	--	50
Stillwell-Bierce Co..............pfd.	--	....	....	2 % Sept 1, '99.	70	65
Shults Belting Co	100	500,000	....	....	80	90
St. Charles Car Co		....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Sept 10, 1900

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s	$500,000	427,500	1940	J. & J.	*118	....
†The Albany Ry. Co......Gen. mtg. 5s	750,000	875,000	1947	M. & N.	*117	......
‖Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Sept 10, 1900

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co..... 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry.......... 1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co

Chicago Ill.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	.	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
'Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s.	$150,000	$150,000	1912	M. & N	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	930,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	300,000	300,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	350,000	350,000	1919	......	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry....................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorised. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry.....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry.......1st mtg. 7s	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co.................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Sept 10, 1900.

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	...	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,033,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	....

Providence R. I.

Date of Quotation—Sept 10, 1900

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Sept 10, 1900

Name.	Amount. Authorised.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J&	17	

*With interest

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PASSENGER RAILWAY.

St. Louis.

Date of Quotation—Sept 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co.....................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	300,000	300,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation—Aug 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000.000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR.........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry..........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation—Sept 10, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co..........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................1s mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg.bds.

Miscellaneous.

Date of Quotation—Sept 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,866,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	......
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,931,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	108
St. Paul City Ry.........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.

Date of Quotation—Sept 10 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	....		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation— Sept 10, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co.................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......

Miscellaneous.—(Sept 10 1900)

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation— Sept 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
NorthwesternTelegraph Co................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—Sept 10, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	.....	......	25
Barney & Smith Car Co......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	....	....	1904	J & D.	......	......
WorthingtonPump Co..............................	75,000	....	......	....	115	127

Unlisted   †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

Calumet & Hecla directors have declared a dividend of $20 per share; the previous distribution was $10.

The Cincinnati Street Railway Company has declared the regular quarterly dividend of 1¼ per cent., payable October 1.

Stockholders of the Havana Electric Street Railway have voted to issue $1,000,000 second mortgage 6 per cent. 10-year bonds.

The Commercial Cable Company has declared the regular quarterly dividend of 1¾ per cent., payable October 1. Books close September 20 and reopen October 2.

Advices from Milwaukee, Wis., state that the Michigan tax commission proposes to increase assessed valuation of nearly all copper mines in Houghton County from 25 to 100 per cent.

The Westinghouse Electric and Manufacturing Company has declared a quarterly dividend of 1¾ per cent. on its preferred stock, payable October 1. Books close September 20 and reopen October 2.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 7½@8¼; New England Transportation, 3@3½; Gramophone, 35@40.

The two principal street railway lines in Fort Worth, Tex., have been acquired for $400,000 by the syndicate headed by J. B. Coffenberry, of Cleveland, Ohio, who announce that they will spend $1,000,000 in electric railways in that neighborhood

All the Chicago elevated roads show big gains for the month of August. The South Side shows 17 per cent. over last year, and the Metropolitan 16 per cent. Earnings of the Northwestern Elevated for August were $682,816. The Union Traction Company will show an increase of $10,766 for the month.

The annual stockholders' meeting of the United Electric Securities Company will be held September 13 at 1 P. M. at Portland, Me. Stockholders will be asked to amend the by-laws to provide for a change in the date of the annual meeting to the last Thursday of March, also making a corresponding change in the date for the beginning of the terms of directors and clerk. Transfer books closed August 31 and reopen September 14.

According to law September 2 was the last day for the Brooklyn Rapid Transit Company to file at Albany its annual report for the fiscal year ending July 31, but no such report was filed. C. D. McNealy, the secretary treasurer of the company, said that the report was too long and detailed to be ready. He said his impression was that the company had until September 15. "No report in previous years," he added, "has been filed on time, and nothing was done in the matter." The report will probably be ready in a week.

The Philadelphia "Stockholder" says: "There are a few people in the street who take a pessimistic view of the Electric Company of America stock, claiming that the position of the issue does not warrant any advance in its price. On the other hand, however, those close to the management, and, therefore, in position to get at facts bearing on the inside workings of the property, claim that the stock is selling entirely too low. It is understood that big money is being earned, and in view of this that the stock is an assured dividend payer."

The annual report of the operation of the Metropolitan Street Railway Company of New York and the report for the last quarter ending June 30, 1900, was filed at Albany on September 10 with the Railroad Commissioners. The report for the year ending June 30, 1900, shows the gross earning to be $14,721,550, an increase of $1,562,920 over last year. Dividends paid were $3,145,891, leaving a surplus of $214,269. Operating expenses are given as $7,104,607. In the report for the fourth quarter, ending June 30, 1900, the gross earnings are $3,849,354, an increase of $185,408. The total surplus is $927,509.

D. Houston & Co. in their copper circular say: England is doing an unprecedented business in copper and the same may be said of the Continent. English copper consumption for the first seven months of this year is estimated at 43,877 tons, or 19,836 tons more than for the same period in 1899. French consumption is returned at 28,391 tons from January to July inclusive, or 5,683 tons more than last year. Germany, however, appears to lead all foreign countries at present in the consumption of copper, where for the first six months of this year 39,696 tons of imported copper (pyrites not included) was the quantity consumed as per official returns. This was 8,034 tons more than for the first half of last year. European demand is a factor of the greatest importance and the foreign consumer is now the principal customer for the product of the American copper mines. During the past four years and seven months ending July 31, 1900, this country has produced 1,064,077 tons of fine copper, and exported during the same period 621,636 tons fine.

The Boston "News Bureau" says: Results of the operation of Manhattan Elevated Railway for the year ended June 30, 1900, agreed very closely with those of the previous year. Maintenance of way and structures showed a decrease of about $20,000, chiefly in repairs of roadway and in repairs and renewal of buildings. Maintenance of equipment decreased about $27,000, renewals of locomotives cost less and renewals of cars more than in the previous year. Wages of engineers and firemen were $902,461, against $863,772. There was a very decided increase in the cost of fuel, the cost being last year $825,638, compared with $772,585 the previous year. The item of train service was nearly the same, also the cost of train supplies and of switchmen, flagmen and watchmen. Station service cost $497,618, against 496,462. An important saving was effected in the legal expenses, which amounted to $105,191, compared with $133,376 the previous year. It is somewhat surprising that the land damages paid by Manhattan continue to show increases. The cost last year was $1,234,878, compared with $1,140,589 in 1899, $864,449 in 1898, $800,281 in 1897, $952,296 in 1896 and $859,671 in 1895. The item of damages ought to begin to decrease after over 20 years of operation of the road, but the contrary seems to be the case.

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EDITORIAL NOTES.

Journalistic Amenities.

The too vivid imagination of an enterprising reporter has furnished an opportunity for Brother Martin of the "Electrical World and Engineer" and for Brother Price of the "Electrical Review" to sit up and prate like two wise-looking but empty-headed parrots in a zoological garden. We refer to the articles which appeared in our worthy contemporaries on September 15 and 12 respectively, on the lighting of San Juan, Porto Rico, which is referred to more specifically on page 163 of this issue of Electricity.

After scanning the pages of the San Juan paper in which the utterly absurd and preposterous alleged utterances appear it would have shown good taste, to say nothing of a due regard for news accuracy, on the part of Mr. Martin and Mr. Price to have called on the parties quoted for some explanation of the matter before rushing headlong into print regarding a subject of which they knew little or nothing. Mr. Martin very magnanimously omits mentioning any names, and to be on the safe side generously intersperses his attempts at sarcasm with such qualifying phrases as "is said" or "is alleged," of "dubious origin," etc. Mr. Martin might have saved considerable of his valuable time and employed it, for instance, in thinking out a nice little after-dinner speech, had he only taken the trouble to inquire the facts of the parties concerned. He apparently preferred, however, to get at the facts "afterwards," and in this he shows the influence of his recent sojourn abroad, in placing, as the French do, the cart before the horse.

Mr. Price does not apparently believe in mincing matters, for he publishes the alleged cablegram in full with all the names and frills that went with it. What has been said regarding rushing headlong into print regardless of facts also applies in this instance to the "Electrical Review." But we are not surprised at anything the "Electrical Review" might do of this nature, as this is not the first time that that worthy publication has placed before its readers inaccurate statements, which it has even refused to retract or rectify when shown to be wrong. The "Review" article says that probably the parties quoted were "misrepresented or that they forgot something." The quotation marks are ours. This is extremely charitable on the part of the compiler of the article, but if something has been forgotten it is by the Editor of the "Electrical Review," and is what is commonly known as journalistic courtesy. Had the facts of the case been ascertained of course the article would have been worthless and would have had to have been omitted and something else substituted, and as matter even in the "Review" has occasionally to be paid for it was a case of "where ignorance is bliss 'tis folly to be wise." Judging from the paragraph before the last of the "Review" article, Mr. Price in his overwhelming egotism apparently considers that he is the only well-known and responsible "electrical engineer" and editor in the United States. As Shakespeare said "It is to laugh!"

* * *

The Work of the National Electric Light Association.

It is scarcely necessary to call the attention of the electrical fraternity to the excellent work that has been and is being accomplished by the National Electric Light Association. The work of the special committees of this Association, has done much to elucidate and straighten out intricate problems, and only last year the report on the "Photometric Value of Arc Lamps" was of a high order, and a credit to the gentlemen who had the matter in charge. The Association is also at work endeavoring to bring about, by drastic measures, if necessary, a much desired change in the present freight classification of electrical apparatus.

These and other good works of the Association are necessarily handicapped by a lack of funds, for, as is well known, the revenue of the Association is derived solely from the membership dues. With a view therefore to strengthening the Association, and thus enabling it to put forth its best efforts for the benefit of the electric lighting industry in general, President J. B. Cahoon has sent out the following letter to central stations that are not members of the Association:

"The work of the National Electric Light Association has broadened to such an extent as to be of vital interest to every electric light company in the country, and we are now confronted with great problems demanding an ample supply of funds for their proper solution.

"The work of our Committee on Photometric Value of Arc Lamps has been of a remark-

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ably high order, and to carry it to its logical conclusion will require an increased fund.

"The Association has taken an aggresive stand against municipal ownership, and is daily helping companies, particularly small ones, in their fight for existence. Companies not members of the Association do not hesitate to appeal to us for help when attacked, yet seem to think that we should go to the expense of collecting and preparing data for their use without expecting them to help foot the bills.

"The Association has now in hand the preparation of a complete and uniform system of accounting: is preparing to fight the present unjust freight classification of electrical apparatus: is engaged in the collection of data of vital interest, and is doing much other work that will benefit you as well as our members. The time has come when, in order to broaden still further our sphere of usefulness, we need your active support and co-operation. To become a great power for the safeguard and welfare of our members, and to present a strong front and successfully beat back the wave of municipal ownership now rapidly extending over the country, we must unite for the common defence. I therefore ask that you do your share by joining the Association: not at some time in the future: when it may be too late, but *now*. The annual dues are so small—only $25—that there is not an electric light company in the country but can pay them and not feel it. A brief letter of application, with check, is all that is necessary. Will you not send this in at once?"

This letter, which admirably sets forth the good work the Association is doing, should and undoubtedly will meet with hearty response from the central stations that have not as yet joined. The benefits to be derived are by no means inconsiderable, and the necessary reforms that need to be brought about in order to benefit the industry as a whole, can only be successfully accomplished on the basis of the old saying, "together we stand, divided we fall."

* * *

American Capital to Furnish Londoners With Transportation.

Last month we referred in these columns to the fact that Mr. Charles T. Yerkes, the well-known street railway financier and promoter, was in London with the object of consolidating the various surface and underground lines in the English metropolis into one enormous system. It now seems that the entering wedge has been driven in and that Mr. Yerkes is in a fair way to ultimately accomplish in London what he so successfully carried out in Chicago. According to a cable dispatch to the daily press Mr. Yerkes has purchased the charter of the Charing Cross & Hampstead Railway for $500,000, and will shortly begin the construction of some six miles of underground railway to be operated when completed by electricity. This initial project will cost, so it is claimed, $20,000,000, which will be exclusively American capital. It is proposed to make this the nucleus of a system of underground and surface railways, which will afford London the facilities for rapid transit—something it has sorely needed.

Mr. Yerkes' railway will be the first important engineering undertaking of the kind on the other side of the Atlantic. The dispatch says that the former king of Chicago street railways "did not come to England to float a company and then unload it on English investors. He is in London not as a promoter but as a builder and investor."

He believes that a fortune is waiting for the man who can weld London's hodge-podge of tunnels, tramways and 'bus lines into a homogeneous electric system, and he wants to be that man.

When the Charing Cross & Hampstead Railway has been built it will be found that Mr. Yerkes is the largest individual owner, and the greater part of the remaider of its capital will be subscribed by Americans who have been associated with Mr. Yerkes in railway enterprises across the Atlantic.

Charing Cross is the center of London. Distances are measured from it as they are from the City Hall in New York. There the London, Chatham and Dover and the Southeastern railways terminate. It is the door through which travelers from the Continent enter London.

The idea of connecting this railway center with the terminal stations of the railways from the North, the London and Northwestern, the Great Northern and the Midland, was conceived by the Southeastern before its consolidation with the London, Chatham and Dover. The necessary charter was obtained from Parliament, but the project was dropped after the amalgamation of the Southern railways.

It was from the Southeastern directors, who obtained the charter from Parliament that Mr. Yerkes purchased the rights.

He will build a tunnel north from Charing Cross road to Tottenham Court road, where a loop will run around Euston station, under Drummond and Seymour streets, and connecting again with the main tunnel under Hampstead road.

From there the tunnel will run off to the northwest, under High street, Camden town, from which point a branching tunnel will connect the main line with the Midland Railway station at Kentish town.

Then it will pass under Chalk Farm road, Haverstock Hill and Roslyn Hill, to Hampstead Heath.

There, on the heights, overlooking all London on one side and the rich farms of Middlesex on the other, Mr. Yerkes will build a terminal station, not far from the famous Jack Straw's Castle, the olden time retreat for highwaymen who made raids on Londoners down in the valley.

Like the new Central London Underground the railway from Charing Cross to Hampstead is to be built in two tunnels.

Sir Douglas Fox, president of the Institute of Civil Engineers, and Mr. William Robert Galbraith have been appointed engineers of the railway, and Mr. R. W. Perks, M. P., its solicitor.

While English engineers will have charge of the construction, Mr. Yerkes' railway will be American in make. The electric power house and electric construction throughout will be American.

Mr. Yerkes is already taking steps to obtain other charters from Parliament for the construction of railways connecting with the main line.

The strangest part of the situation is, judging from the tone of the British press, that Londoners are so anxious for up-to-date means of transportation that they are willing to accept it on American plans and at the hands of an American promoter, provided only that the antiquated lumbering busses, now extensively in use, are ultimately done away with.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The coal strike which is now in full swing in Pennsylvania, and which involves the idleness of some 100,000 miners, if protracted should seriously effect many electric lighting plants throughout this section of the country. The price of fuel will be bound to go up several dollars a ton, which would be a very important matter. It is to be hoped therefore that the questions at issue may be settled by arbitration.

The Babcock & Wilcox boilers have been awarded the Grand Prix at the Paris International Exposition of 1900.

It is claimed that electricity has made enormous progress in Japan during the last few years. In 1899 the country possessed no less than 26,453 kilometers of telegraph with 1,342 stations. The capital, Tokio, is now lighted by more than 60,000 electric lights.

An up-to-date electric ambulance service has been added to Roosevelt Hospital in this city, consisting of two electric rubber-tired automobile ambulances, able to travel 16 miles an hours, each weighing 4,800 pounds and costing $3,000 apiece. They are gifts to the hospital, one that of a prominent physician of this city. The new ambulances are provided with brakes which Lucius T. Gibbs, the designer, declares will bring them to a dead stop within six feet while running at full speed. Similar ambulances are being made for the New York and Presbyterian Hospitals. St. Vincent's already has an automobile ambulance.

According to a report a prize of 1,000 francs is waiting for the inventor who shall produce a glove that can be used by electrical workmen to safeguard them from accident. The premium is offered by the French Accidents to Workmen Assurance Association, and the conditions are: That the gloves must cover the forearm as well as the hands: that they must be light and leave the utmost liberty to the fingers. If one specification does not come up to the required standard the prize will be divided among the inventors who most nearly approach it, the decision being left with a special commission nominated by the Association.

General Greely, chief signal officer, who went to Alaska to arrange for telegraphic communication with that territory, reports that by using the Canadian line there will be communication with Fort Egbert, Eagle City, by the end of September. The Canadian line extends from Ashcroft north to Dawson City and the boundary. The United States has constructed a line from Fort Egbert to meet this line. Another one is being built by the United States up the Yukon River, which it is intended shall connect with Fort Egbert, but it is not likely that it will be completed this season.

The municipality at Blackburn, England, proposes to borrow about $980,000 for extending the electric plant of that city. A. S. Giles is the electrical engineer. As American electrical material is extensively used in British undertakings the prospects are that the engineer in charge will begin to make inquiries soon after the above-named amount is obtained.

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IT is reported that the Santa Fé railroad will soon inaugurate a new idea for the electric lighting of passenger coaches. About two years ago this company equipped 100 passenger cars with an axle lighting system and a thorough trial was given the device but was found not to be sufficiently reliable to warrant its use on trains. The officers have now decided to remove the old axle device and make a trial of a greatly improved axle lighting system. Twelve cars will be equipped with the new apparatus, and when complete the test will begin, and will be in continuous service for six months. The cost of equipping with the new axle system is $750 per car.

A MEDAL has been awarded the Chicago Fuse Wire & Mfg. Company by the International Jury of Award for the exhibit of that company at the Paris Exposition. The exhibit consisted of a complete assortment of "Trade Mark" tested fuse wire and fuse links.

THE instant success of the moving stairway or inclined elevator at one of the elevated railway stations in this city, says the N. Y. "Commercial Advertiser," is hailed as a delightful surprise, as if there were something experimental about the invention. As a matter of fact there has been no doubt whatever about the practicability of this and simliar devices for several years past. If the elevated railway company had chosen to place them at all its stations long ago its loss in traffic would have been far less serious than has been the case. Most persons, and all ladies, dislike stair climbing under the best of conditions, and detest it in the case of the elevated stairways, which are never clean and often filthy. If the company were to replace these objectionable methods of approach with elevators of any kind, there is no doubt that it would secure at once a great increase in its volume of traffic. Its refusal to do so is in accordance with its general policy of making few improvements, no matter what the demand might be. With moving stairways and electric traction the elevated lines would suffer far less from surface competition than they do at present; and this fact is no more obvious to-day than it has been every day for five years or more.

AN invention has recently been brought out in England by means of which "lost chords" in music are to be prevented. In the London "Globe" it is announced that a Mr. Vaughan Neale has completed an electrical machine which is to register extempore compositions upon the piano. The arrangement can be attached to any ordinary piano, and it is reported that the machine has taken down a tarantella played at the rate of 2,000 notes a minute. The attachment, it is stated, does not interfere with the touch.

ELECTRIC toys will be all the rage for Christmas presents this year if dealers in such things have forecasted the popular taste in the right way. Many of them were sold last year, but fathers and mothers were still nervous about the danger of possible shocks. The efforts of the inventor have been directed toward turning out toys that cannot possibly transmute the slightest current, and the clerks will be able to guarantee perfect safety. Many of the electrical toys are fitted with connections for stealing power from the electric light wires, which does away with dry and wet batteries, and will make parents less nervous about the danger. One of the newest electric toys is an automobile cab in miniature. It has batteries between the wheels, rubber tires, cushioned seats and nickel steering gear. In it dolls can ride around the dining-room table or parlor floor, and absolutely without danger, unless the speed becomes too great. An electric torpedo boat with a storage battery capable of running it at a high rate of speed will be another popular toy. The torpedo boat is an exact model of some of the smaller boats used in the navy, and has enough air-tight compartments to keep it afloat should some parts chance to fill with water. The steering gear can be set at any desired angle, and the boat will circle park ponds for an hour at a time. A submarine boat will be the next thing demanded by Young America, now that the Holland is proving a success.

THE line of telegraph from the coast to the Lake Victoria Nyanza in Africa has recently been completed, and the advantages which it will confer on the inhabitants of Lower Egypt will be enormous, says the London "Electrical Engineer." As is well known, the natives depend on the rise of the waters of the Nile for the irrigation of the land, and hitherto they have only known a very short time beforehand the condition of the waters. Now, however, that communication has been made from the sources of the Nile, the required information can be sent several months in advance, and the Egyptians can regulate their supplies. Messages, also, are now sent in a few days, which previously took seven months to communicate.

ONE of the most interesting and difficult feats in the history of railroading is to be carried out in Southern California by the interests owning the Los Angeles Railway. Since the owners of this corporation (the Huntington syndicate) acquired the Mount Lowe Railroad, their engineers have been at work upon plans and surveys for the improvement and extension of that picturesque and unique line. Plans are now completed for straightening the line from Altadena to the base of Echo Mountain. But the most interesting part of the story is contained in the following statement of General Manager C. W. Smith: "Ultimately a trolley road from the top of Echo Mountain to the Alpine Cavern will be extended across the ridge and up to Wilson's Peak. We have found it is perfectly feasible to carry this road to the summit by way of Martin's Camp, and it will surely be done." A trolley ride along the top of the Sierra will be an exhilarating excursion. There will be nothing like it elsewhere in the world.

FRANK LOOMIS, United States Minister to Venezuela, lately arrived in Washington on leave of absence from his post. Mr. Loomis says that commercially there has been a great improvement in affairs in that country. Among the American enterprises under way is the erection of an electric light plant at La Guayra to light Caracas by long-distance transmission of power.

MORE than $100,000,000 worth of india rubber has been imported into the United States during the past four years, and more than $60,000,000 worth in two years. Ten years ago the annual importations of india rubber amounted to about $15,000,000, now they exceed $30,000,000 and are steadily increasing. Almost all the rubber imported comes in a crude form for use by manufacturers, who are constantly extending its application to various new lines of industry. Northern Brazil, Southern Mexico, the West Indies, Central Africa, India, the Straits Settlements and the Dutch East Indies supply this article, which has no equal for rapid growth.

INQUIRIES from Italy for electric machinery and material continue to arrive in greater proportions than from any other part of Southern Europe. According to an electric engineering firm of this city their average weekly shipments to leading ports of that country reach all of $15,000, and recently they secured a contract at Catania which will necessitate the taking of upwards of $30,000 worth of material and machinery to that place. In mechanical development equally as good opportunities are said to exist in Italy, but they are taken advantage of by European firms because little attention is given to direct business by Americans.

THE LIGHTING OF SAN JUAN, PORTO RICO.

My attention has been called to the issues of August 21 and September 1 of the San Juan "News" of Porto Rico, in which I am credited with having made a number of statements to a representative of the N. Y. "Sun," regarding the lighting of San Juan by means of a high tension electric lighting system. I beg to say right here that the statements credited to me are false from beginning to end with one exception. The whole story of the matter so far as the writer was concerned is as follows: A representative of the N. Y. "Sun" called at my office and asked if I could refer him to some one from whom he could get an opinion on the lighting of San Juan by means of a high tension electric system. I referred him to Mr. Newton Harrison, editor of the "Electrical Age," knowing that in all probability Mr. Harrison would give him a conservative opinion on the subject.

The "Sun" representative then asked if I would offer an opinion on the subject myself, to which I replied that I would rather not, not knowing the circumstances, local conditions, etc. This statement, which appears in the alleged interview, is the only one by the way that is correct.

The reporter then said that it was proposed to string high-tension wires across the roofs of the houses, and inquired if I did not think they would be apt to cause accidents especially in a town where most of the inhabitants spend a large portion of the year on the roofs. In reply to this, I said that under the circumstances high tension overhead conductors might be more or less conducive to accidents, but I said nothing about such a course of procedure being a crime or murder, as reported in the San Juan paper. This was the sum and substance of the alleged interview, which some one cleverly, but unjustifiably, manipulated to suit his purpose. It will be seen that I neither opposed nor recommended any system of lighting for San Juan, neither did I state that all the wires should be placed in conduits in that city.

W. L. HEDENBERG,
Editor ELECTRICITY.

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THE SLABY-ARCO SYSTEM OF WIRELESS TELEGRAPHY.*

The Slaby-Arco system, as described in a pamphlet issued by the General Electric Company of Berlin, though based on essentially the same principles as the Marconi system differs from the latter in some important respects. The vertical wire for example which is insulated in the Marconi arrangement, is in the Slaby-Arco system connected with earth for both transmitting and receiving.

The connections of the transmitting apparatus are shown in diagram 1. A condenser, C, is charged with high tension electricity by the induction coil, J, and discharges itself on one side through the spark-gap, F, and the transmitting wire, and on the other side

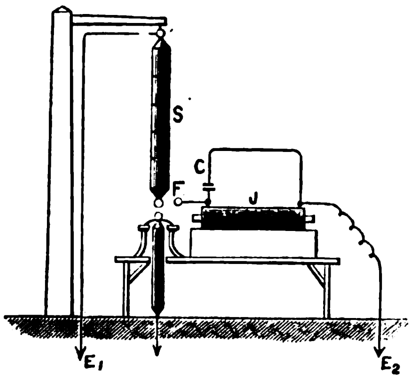

Diagram 1.

through E_2, direct to earth. According to the inventors the technical advantages of this arrangement are very decided, for as only one of the condenser plates and one knob of the radiator parts which can be permanently insulated, and from which danger to the operators can be completely prevented—are at a high potential relative to the earth, difficulties of insulating the transmitting wire are obviated; and even on taking hold of the wire scarcely perceptible shocks are felt.

For the production of the high potential the inventors ordinarily use a 40 or 50 cm. induction coil with a mercury turbine contact breaker; the coil may be directly connected with an

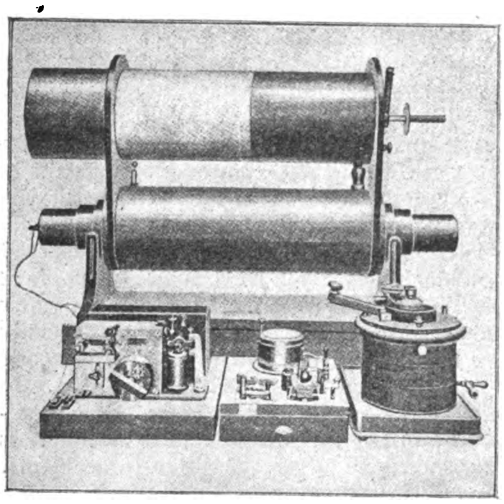

Fig. 1.

electric light circuit, thus dispensing with accumulators or dry cells. The use of a special Morse key is rendered unnecessary by a suitable appliance fitted to the turbine contact breaker. If an alternating current is available the arrangement becomes still simpler and more convenient, since in that case the contact breaker can be wholly dispensed with, and the induction coil can be directly connected with the alternating current circuit. The condensers used are made of "micanite," and are mounted on the induction coil itself, this being done in such a way that the high tension pole of the induction coil and of the condenser is protected from contact. (See Fig. 1.)

The arrangement of the receiving apparatus is shown in diagram 2. In this figure S is the aerial wire netting, F the coherer, R the relay of the Morse instrument, and B the battery.

The action of the receiver is such that, when the initial high resistance of the coherer has been reduced by the etheric waves, the battery, B, is enabled to send a current through the relay, the aerial wire, and earth.

It is a characteristic feature of the receiving apparatus that the pulsating magnetic field produced by the transmitter may be received not only on a simple aerial wire, but also on an earthed wire cage or netting, whereas in previous arrangements the waves which reached the coherer, F, were shunted by the local circuit, and their effect was thereby weakened; in the Slaby-Arco system the series arrangement adopted completely removes this defect; atmospheric disturbances are also greatly diminished by the series arrangement.

Another improvement in the receiver consists in the introduction of an automatic interruption of the coherer circuit. Matters are so arranged that the blow of the tapper is only given to the coherer tube after the tension of the coherer elements is taken off. By this means not only is easy and satisfactory decoherence effected, but the life of the coherer is said to be considerably prolonged, since the

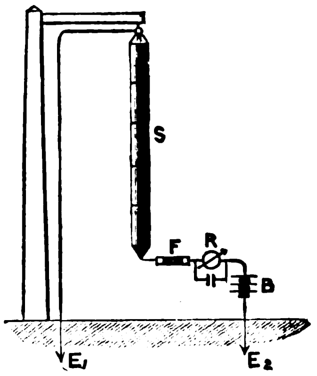

Diagram 2.

sparks on breaking circuit, which would otherwise occur in the interior and would gradually destroy the coherer powder, are caused to take place externally.

A further improvement is claimed in the construction of the coherer, a variation in the sensitiveness of which is rendered possible by means of hermetically sealed leads. The coherers are all tested for long distances, but each receiver for movable stations is furnished with an appliance for diminishing the intensity, so that the apparatus, in spite of its great sensitiveness, will work perfectly even at very short distances.

It is claimed that the system is particularly useful for communications between ships at sea or ships and the coast, and that experiments carried out by the German navy prove that for such purposes the system is perfectly reliable.

At present the radiating power and sensitiveness of the apparatus is such that signals can be safely transmitted to distances of 25 to 28 miles over sea with vertical wires 38 to 44 yards high.

On land the General Electric Company maintain communication between their cable factory at Oberschoneweide and their central office in Berlin, a distance of 9¼ miles. The vertical wires, about 55 yards high, are supported by two tall chimneys.

The advantages of the Slaby-Arco, system, as compared with other systems, consist, it is stated, not so much in its superiority in respect of the distances, as in its practical serviceability, prevention of danger from high pressures, avoidance of difficulties of insulation in the transmitter, and of atmospheric disturbances in the receiver, together with a greater solidity and simpler manipulation of the

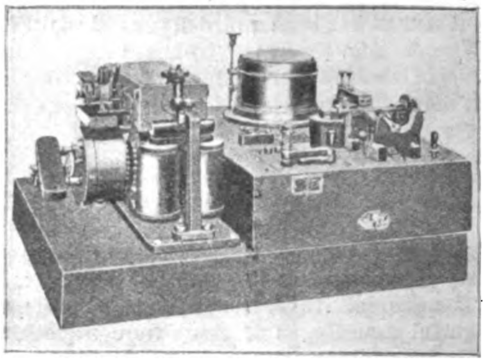

Fig. 2.—Receiving Apparatus.

whole receiving apparatus. It is for these qualities that the system has been adopted by the German navy.

* From the "Electricial Review," London.

Short vs. Long Filaments for Incandescent Electric Lamps.

With the increase in the working voltage at which incandescent electric lamps are run, the problem of the production of the filament that will give the proper amount of light at a reasonable efficiency, and with a reasonable length of usual life, has become a serious one. In order that the filament shall do its work properly with a high voltage, say 200 volts, as against 100 volts, or even 50 volts, it must be made longer in proportion to the pressure, and is therefore necessarily weaker. Of necessity it is also of smaller cross section, as it has to be raised to the same temperature as the lower-voltage lamps, with half or quarter the current strength that is passing through them; hence it is doubly weak. Two methods have been adopted in dealing with the problem. In one form of lamp the filament is made the full length and turned into a curl, but otherwise unsupported except at the ends where it is joined to the platinum wires which deliver the current to it. The other method is to make the filament in two or three pieces, each supported at its ends, and to deliver the current to each piece. This latter method again has two variations. The positions of the filament may be connected in series, as the cells of a signal battery are connected, the pressure being only applied to the outside ends of the two, one end of each; or they may be connected in parallel, just as incandescent lamps are connected to a supply service, each end of each filament being supported and connected to the platinum wires, which again are connected to the supply wires. One American firm of lamp makers claims considerable advantages for the parallel method, but in the writer's opinion it is very doubtful if the claim is justified, though American electricians have shown themselves very skillful in the manufacture of incandescent lamps. In order that the parallel method

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may be adopted, it is necessary that the lamp filaments shall be reduced still further in sectional area, and consequently they are all still weaker than the filaments that are connected in series. In addition, there is some doubt as to the wisdom of having more points of entrance for the current than are necessary. Wherever a break in the continuity of the electric circuit takes place, the current produces the effect that the conductor on each side of the break becomes very brittle, so that one would expect filaments arranged in this manner to break off rather frequently at the points of junction. The brittleness mentioned above may be noticed in the connections of telephones, bells and similar apparatus, where comparatively small wires are used. With the incandescent lamp the action is intensified by the expansions and contractions which take place in the filament between the temperature of full light and that of no light—"Colliery Guardian," London.

AUTOMATIC BLOCK SIGNAL FAILURES DUE TO LIGHTNING *

BY H. D. MILES,

Signal Engineer, Michigan Central Railroad.

There are two kinds of failures of automatic signals due to lightning, the failure of signals to clear and the consequent delay to traffic, and the failure of signals to go to danger, and the consequent imperiling of safe train movements. Three years ago the efforts of signal and railroad companies were directed to the abolition of the latter evil, and I believe that I am within the truth in saying that it is possible now to prevent (except possibly in rare instances) lightning or any high potential foreign current causing the false display of clear signals. To-day the problem is how to avoid the other evil, namely, the setting to danger of automatic signals due to the action of lightning currents. The introduction of the carbon contact for relays and their use in combination with fuse wires has solved the first problem. A lightning arrester which will take care of the heavy discharges without opening the circuit, combined with the use of carbon to prevent the fusing of relay contacts by so much of the lightning current as may pass through the arrester, is the device apparently which must be employed to solve the second problem. I believe that it is too early to say that the solution of the latter has been accomplished, nevertheless the service rendered by the choke-coil lightning arrester encourages the belief that it or some better device will accomplish what is desired. The fuse wire is the chief agency of our present woes, and until it is dispensed with, the block signal maintainer is sure of an abundance of calls during the lightning season.

The only utility of fuse wires where carbon contacts are employed is to protect the relays and signal instruments from the heavy lightning currents; if these can be diverted to the ground before reaching the instruments the problem will be solved. It is possible that the railroads, through over cautiousness, have made too free use of low capacity fuse wires. A great many one-ampere fuse wires are blown by currents which would not injure the instruments were no fuse wires used. Feeling that a brief history of the steps taken by the Michigan Central to overcome the difficulties mentioned might be of interest to some, I will endeavor briefly to explain what has been done in the past and what it is proposed to do on an installation of 15 miles of double track blocking which is to be installed in Canada this fall. The Michigan Central has not been subjected to unusual conditions, nor has it applied any untried devices to overcome the difficulties. The interest, if any, must be found in the number of patients cared for and the effects of the remedies prescribed. One hundred and forty-six miles of double track blocking is in use, and a fair amount of lightning is allotted to this territory each year. One hundred and thirty-six miles of this blocking is controlled by the track circuit, the remaining eight miles by the track instrument system.

Previous to 1896 the Michigan Central had 31 miles of automatic blocking in service, a little more than half of which was controlled by track circuit. Practically no trouble was had with the track instrument system as the line wires did not lead to ground or come into close proximity with grounded circuits. The signals controlled by track circuit were affected some, but as the line wires were mostly confined to the over-lap section, and as few lightning storms passed over this territory during the two years in which these signals were in service prior to 1896, the difficulties experienced were so few that the lightning question was considered of little importance. During the summer and fall of 1896, 110 miles of the track circuit system of automatic signals were installed, but were put in service so late in the year that it was not until the spring and summer of 1897 that the importance of the lightning problem was realized. On this installation indicators were used at all main track switches and the consequent long lines of overhead wire, necessitated by the introduction of the indicators, aggravated the difficulties. The first arrester used to prevent the fusing of contacts and the burning of magnet coils was the old-style saw-tooth type, the ground plate being connected with the relay wires which led to the rails of the track. The lightning currents which fused the relay points did so on account of the path afforded through the track relay, track wires and rails to ground, and as the air gap between the contact strips and ground plate of the arrester was less than that between the armature and magnet coils of the track relay, it was naturally inferred that high potential currents would take the path of least resistance and thus avoid fusing the contact springs. The service rendered by this form of arrester, even when combined with fuse wire protection, did not prevent the fusing of platinum contact points, and consequently these arresters were abandoned in 1898 and carbon contact strips and ground plate arresters having a high resistance substance for making contact between the ground plate and the contact strips, which were connected to the track and line wires, were substituted. One-ampere fuse wires for track and two ampere fuse wires for line circuits were used in connection with these arresters, the ground plates in this case being connected with galvanized iron pipe driven in the ground, experience having proven that the use of the rails as grounds increased the number of signal failures.

To further guard against the danger of fused points, carbon points were used in relays to control all line circuits and the Buchanan back contact shunt was applied where track circuits were controlled, in order to shunt the track battery should the front contact fuse. It was considered impracticable at that time to use contact points made of carbon for controlling the low potential track currents, on acount of high resistance of that substance. Since these alterations were made there has not been a single case of a signal being held clear by fused contacts, although many instances have occurred of the signals being held at danger on account of blown fuse wires; for instance from January 1 to August 20, 1900, 36 per cent. of the failures of signals to clear were caused by lightning, and nearly all of these failures were due to blown fuse wires. In 1899 five miles of the semaphore type of automatic signals were installed, carbon contacts being used to control all circuits, and 2½ ampere fuse wire and choke coil lightning arresters being used in all line circuits, no safeguards other than carbon contacts being provided for the track circuits. In this instance the arresters, instead of being in the relay boxes, were located in cast-iron boxes on the telegraph poles.

Two types of choke-coil arresters are employed. In one the coil of wire is wound on a hard rubber spool or cylinder, in the other the wire is wound on a porcelain spool having a hollow center in which is inserted a soft iron core. The Hall Signal Co. claims, from a series of tests made with a high potential current, that the simple choke-coil arrester discharged about 54 per cent of the current to ground, while the iron core coil discharged 95 per cent. of the current to ground. I believe the theory being that the iron core offers an additional retarding effect to the flow of the current, thus causing it to discharge more freely to the ground plate. On this latter section of blocking no signal failures have occurred due to lightning since this installation was completed, although lightning troubles have been experienced both east and west of this section of blocking, and the porcelain spools of three of the arresters have been shattered by lightning. It is too soon to judge of the efficiency of this method of protection, but as there are line wires throughout each block and several lightning storms have passed over this section, the inference to be drawn encourages a fair hope for the future. On 15 miles of double-track blocking to be installed on the Canada division this fall the semaphore type of signal will be used and distant signals will be provided instead of over-laps. Polarized relays instead of line wire will be employed for controlling the distant signals, thus reducing the field for lightning troubles as far as possible.

Where line wire is used for indicators and for controlling slots on interlocking signals, the choke-coil arresters with iron core centers will be used, but no fuse wires will be employed either in the track or line circuits. Carbon points will be depended upon to prevent fused contacts due to light discharges, and the choke-coils will be depended upon to take care of the heavy discharges. The majority of the blocks on the Michigan Central are two miles in length, and each two-mile block is subdivided into four sections, consequently there are numerous cases where the relay of one section controls the battery of the next section. The use of carbon contacts for controlling track batteries in this way has been found satisfactory on the five miles of blocking installed last year. The average resistance of carbon contacts, established by several tests on instruments of two years' service, was 1-3 of an ohm. The average resistance of one-ampere fuse wires which were in service but a few days, based on severel tests, was 1-5 of an ohm, there-

*Paper read at the meeting of the Railway Signaling Club, Sept. 11, 1900, at Atlantic City, N. J.

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fore by the substitution of the carbon contact for the fuse wire, only 2-15 of an ohm's resistance was added to the circuit, and this is far from a prohibitive resistance, even when the ballast is against the rails, as in the case on the Michigan Central, and this difference in resistance is considerably reduced as the length of service of the fuse wire is increased.

Greater effort will be made to secure good ground connections than has been made in the past. A great many failures of lightning arresters to properly perform their function may be attributed to imperfect ground connections, therefore no reasonable expense should be spared to secure good "grounds." It is proposed to dig holes deep enough to reach permanently damp earth, to imbed copper plates in crushed charcoal at the bottom of such holes and to use copper wires to make the connections between the copper plates and the arresters. It is anticipated that on this installation damp earth will be found at a reasonable depth.

It will be an easy matter to provide fuse wires if their service is found necessary in order to protect the relay and indicator coils from frequent injury, but an occasional damage to such instruments will be considered of less importance than the frequent blowing of fuse wires.

ELCTRO-CHEMISTRY IN A DYE AND PRINT WORKS.*

BY A. E. SUNDERLAND.

The action of the electric current upon dyewares and intermediate products may be brought about in several ways, of which the following are the most important: The action of the electric current upon the substance itself, at the ordinary temperature if a liquid, or if a solid, above its melting point. The action of the current upon the body dissolved in some solvent. This gives the best results.

The first methed does not give such good results as when dealing with inorganic substances, for it is too severe in its action, and usually resolves the compound into its elements. Certainly, intermediary products are formed, but these are so difficult to isolate that as a commercial method it is not to be recommended. Most members of the aliphatic and aromatic series in a molten state can be resolved into $CO_2 + H_2O$, etc., with the production of intermediate products such as oxalic acid and glycollic acid in the aliphatic series, and hydroquinone ethers and hydro-oxy carboxylic acid in the aromatic series. The simplest apparatus employed consists of two tubes joined together by a water-tight V joint, each leg containing a circular disk pole. The dimensions of the tube, the quantity of liquor, the strength of the current, and the amount consumed should all be known.

The nature of the products obtained by the electrolysis of organic bodies depends upon two things: (1) Whether the body is a good electrolyte or not, and if not, what bodies are used to make it so. (2) Whether the decomposition takes place in an acid or alkaline medium; totally different products being usually obtained by electrolysis in each medium. The primary action which takes place in an electrolytic cell is an ozidizing action at the positive pole and a reducing action at the negative pole, and the best results are gotten by adapting the process so that the products thus formed are immediately removed from the field of action. This may be done in several ways: (1) Automatically by making use of the different densities of the solutions. (2) By raising or lowering the temperature of the cell. (3) By using different electrolytes in the anode and cathode chamber. (4) By using such an electrolyte that the body formed is totally insoluble in it, and thus falls out of solution, and is unacted upon by the current.

The chief interest in the electrolysis of organic compounds centers in the behavior of the hydro-carbon radicle, which both in the aliphatic and the aromatic series seems to be very stable. The most important reactions are, however, the reduction of aromatic nitro bodies in alkaline solution, first to azo compounds and then to hydrazo compounds, these changes being produced in a very satisfactory manner, and the yield being equal nearly to the theoretical. If the same electrolyte is used in the anode and cathode chambers, the electrical osmosis is very noticeable, and is one of the chief difficulties in adapting these processes on the large scale, and results obtained tend to emphasize the law of Clausius and Hittorf, that the electric current does not overcome affinities, but that the chief reactions are produced by the primary electrolysis of the electrolyte into hydrogen and oxygen.

As regards the actual production of dye-stuffs by electricity, very few results have been published, and the known cases, such as the production of methylene blues, alizarin black, etc., simply depend upon the oxidizing action of the electric current in the anode cell, Goppelsroeder, in 1886, published several results which he had obtained on a laboratory scale by the oxidation of various primary amines. He states that by the action of the electric current on aniline hydro-chloride in acid solution, emeraldine and aniline black are produced, and by the electrolysis of aniline salt alone a brown precipitate and red to violet coloration only is obtained. Further results which Goppelsroeder recorded are as follows: With methyl aniline he obtained a blue coloration; with diphenylamine, a violet coloration; with salts of napthylamine, brown bodies; with napthol, a golden yellow; while magenta, methyl alcohol, and potassium fluoride gave Hoffmann's violet. Goppelsroeder also produced aniline from nitrobenzine, and alizarin from anthraquinone.

Electricity may be applied in the dyeing process itself in two ways: (1) in printing. (2) in the dye bath. With regard to electric printing Goppelsroeder proceeded as follows: A plate of lead or other suitable conducting material is used as the negative pole, and the stencil pencil or plate is used as the positive pole. Between these is fed the cloth impregnated with the various chemicals. On passing the current, decomposition of the various chemicals take place wherever the stencil plate touches, and the design is produced. As instances: (1) If the cloth be impregnated with an acid solution of aniline salt an aniline black figure is produced. (2) If the cloth be impregnated with potassium thiocyanate a yellow to orange figure is produced. Goppelsroeder also found that some dyes, such as turkey red and indigo blue, could in the same way be discharged white by the electric current, and thus by combination with the analine black and canarin yellow, he could produce white, black, and yellow prints on red or blue ground. If metallic oxides were used, the oxide was precipitated, and the cloth on dyeing with alizarins, would show a design where the current had passed.

These results, as obtained by Goppelsroeder, are very interesting, and with the azo dyes some equally interesting results have since been obtained. The diazo compounds are so unstable that they are decomposed by ordinary daylight. I have subjected such to the ordinary current, and find that with a current of 20 volts to 40 volts 5 amperes a five seconds' contact will in some cases cause the decomposition, and on developing, the print will remain undeveloped. This discharge, however, is not quick or good enough, but it can be intensified by mixing along with the diazo compound a certain amount of sodium chloride, nitrate, chlorate, or other suitable chemical, which will, on the passage of the current, liberate compounds capable of discharging the diazo compound more thoroughly. Such reactions may be greatly extended, and by making use of the colors themselves instead of bases which contain the amido group, some very useful effects can be obtained, such as, for instance, with rosaniline, red and dark brown patterns can be obtained; with safranine, red and dark blue, and with cyanole some very peculiar combinations can be obtained. Cyanole on diazotizing becomes yellow, but wherever exposed to air or some oxidizing agent, such as an electric current, is turns a fine peacock blue shade, and on washing the print with a phenol or soda the effect is permanent. This, along with the use of bases such as thiotoluidines, gives some useful results. Another branch of printing by electricity, which also offers some very interesting information, is the combination of organic cases along with the use of metallic anodes. This may be made use of for the production of effects of the opposite kind to the above, and most certainly in cotton and paper printing it is worth experimenting with.

There are only two machines I have seen recommended for electrical dyeing, and these in no way offer any advantage over ordinary processes. From my own experiments, I consider that a machine for this purpose should fulfill the following requirements: (1) The poles must not be of metal, but of carbon or biscuit porcelain, which conduct by becoming saturated with the electrolyte. (2) They must be as near to one another as possible. (3) The cloth must pass between the poles in the open width. (4) The poles may be perfectly smooth, and preferably cylindrical, revolving freely. These particulars are necessary, because in the ordinary passage of the electric current across any dye solution, the tendency of the dye is to concentrate itself around the negative pole, and not to circulate freely in the whole dye vessel, thus there is always a great danger of unevenness.

In the finishing of goods the peculiar effect which is produced by calendering a piece in two different directions, one impression upon another, is well known. This is technically termed water-marking or moire, and is due to the irregular reflection from the surface of the material, one part of the light being totally reflected, and the other part dispersed. This effect can be introduced in several ways. One way is by displacing the warp or weft threads in an irregular manner by means of combs. Another method is by placing the chief reflecting surface below an upper gauze surface, which being free to move causes a constant change of reflections, and produces this effect in a very pretty manner. But still another method is by electricity. The new process resolves itself practically into the local application of electrolysis. A platinum plate of suitable size is

* Paper read before the Society of Dyers and Colorists at Bradford (Eng.) Technical College.

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connected with the positive pole of the source of current. On this conducting surface is placed some absorbent material saturated with a solution of common salt. On this pad is placed the fabric to be water marked, and the plate engraved with the water mark connected with the negative terminal is pressed down upon it. The salt solution is decomposed, and a facsimile of the water mark is printed on the cloth. To produce opaque designs, the absorbent material is saturated with a solution of barium chloride, which is decomposed on passing the current.

The electrical pressing machine introduced by Schreihage may also be mentioned. By its employment it is possible to hot-press any description of fabric for any duration of time, at any required temperature, and all this in an apparatus which is perfectly clean and dry, and in an atmosphere free from superfluous waste heat and steam. An ordinary press is used, and may be operated hydraulically or by any other method The press is identical with those in ordinary use. Press boards are provided, composed of suitable insulating material, inside which are embedded the heating wires. The ends of these wires terminate in a double plugway in front of each plate. The switchboard is mounted on wheels for convenience. It can thus be utilized for any press, or can be wheeled into a corner out of the way when not required. The fabric is placed in the press in the ordinary manner, and the current switched on. The plates become warm almost immediately, and when the current is switched off are soon cool enough to handle. The cost of the process is, I understand, not more than the present method of pressing when everything is taken into consideration.

THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, ITS FIELD AND WORK—PAST, PRESENT AND FUTURE.

[At the recent convention of the Association of Edison Illuminating Companies, held at Saratoga, N. Y., Mr. J. W. Lieb, Jr., in his presidential address reviewed the history of the organization. The following is an abstract of his remarks.]

The object of this Association, as defined in the constitution and by-laws, is: "The mutual protection of business interests, and the collection and dissemination among its members of technical and business information relative to the Edison electric light system and auxiliary systems operated in connection therewith" You will thus see, at the start, from this statement of the objects of the Association, that there is a striking difference between our organization and kindred organizations—such as the American Institute of Electrical Engineers, the National Electric Light Association and many of the State organizations. Instead of being a purely technical body, like the American Institute of Electrical Engineers, this Association while, in one sense of the word, technical, has, in addition, important commercial interests to safeguard. One of the conditions of membership requires that its members be licensees under the Edison patents; that is, licensees of the Edison Electric Light Company, the Edison General Electric Company or the General Electric Company.

There is one striking peculiarity in our organization and that is that companies and not individuals constitute the membership of the Association. The officers are merely representatives of the companies constituting the Association. This fact, which is peculiar to our organization, has advantages and possibly some disadvantages. It is, of course, to be expected that in a body of this character, in which manifold interests are represented, and which has such a wide field of activity, the larger companies take a predominant interest. This must be the case from the connection of many of its representatives with the original Edison interests; it must also be so from the fact that the larger companies have large executive and operating staffs, and therefore are more largely represented in the conventions and as authors of the papers that are brought before it. I think you will agree with me, however, that in the work of the Association, due weight has been given to the value of the membership of the smaller companies, and that every effort has been made to stimulate their interest and attendance, and I am happy to say that in this respect we have been markedly successful. The smaller companies by their attendance and active interest in the work of the Association have, in turn, stimulated the larger companies in its behalf.

In the early days of the electric lighting industry the standardizing committee of the Edison interests did valuable work in the standardizing of Edison chemical meters and many Edison appliances, one of your former presidents, Dr. A. E. Kennelly, rendering valuable service in this field. Much of this early work has been of value, not only to the Edison interests, but has become part of the history of the art. Many of Dr. Kennelly's investigations and experiments conducted in connection with this standardizing work have become the accepted reference data in electrical engineering work. I need only refer to his tests on the carrying capacity of wires under different conditions, cross section, insulation and environment. This Association, through its member companies and their technical staffs, has done valuable work for the industry generally; through their close relations they have been able to find useful applications for newly developed apparatus, and once found, these types have had prompt and general adoption to the material benefit of themselves, and the general advantage of the electrical industry. I refer in this connection to the stimulus given to the application of storage batteries to central station service, by the pioneer work of some of the larger companies, by the interchange of experience in their use, inducing others to determine each for itself the advantages which it might derive from their use. There can be no doubt that the work of the companies constituting your membership and the reports of your committees have materially contributed toward the development and improvement of what is now considered an invaluable adjunct to central station and distributing equipment. I will also refer, briefly, in passing, to the influence which the members of the Association have in stimulating the manufacturers to produce new apparatus to meet new requirements as they arose; and to the influence of the individual companies in stimulating the development of such apparatus as the first examples of direct connected units, arc lamps on low tension circuits, rectifiers, phase and frequency changes, composite generators, etc. The members of this Association have exerted a constant pressure upon the manufacturing companies in bringing them to realize that they must develop apparatus to satisfy the new conditions and requirements as the extension of their business developed new wants. It is unquestionably true that the manufacturing companies have in turn profited by the development of this apparatus, being able to find at once purchasers and an outlet for their product among our companies, whose close connections enabled them to promptly appreciate the value of newly developed apparatus.

During the existence of the Association, the member companies have gradually broadened their business field. Originally confined to companies that were Edison licensees, exploiting exclusively the Edison system, most of the companies now find themselves in new relations with their former powerful and conservative competitors, the gas interests; new relations in connection with the development of transmission lines in conjunction with their distributing systems; new relations in connection with alternating current generation and distribution, and new relations in connection with the joint operation or absorption of series arc systems. These new relations must necessarily bring us into contact with new problems with points of view broader than simply the Edisonian, and it is hardly necessary to say that contact with these new interests and the assumption of these new relations must be of great benefit to us. Take, for instance, the gas interests. For years, they have been developing their business and organization, and their knowledge of the public and its requirements must be vastly superior to the knowledge possessed by those engaged in our more recently developed electrical industries. Their methods and policy have been developed on conservative lines, their usually strong financial position attesting executive ability of the highest order, and we certainly must profit by closer relations, with this older well-established industry. They, in turn, must profit by feeling the youthful pulse of the new industry which, in spite of opposition and keenest competition, in spite of large vested interests arrayed against it, has been able to assert itself and claim a permanent position as one of the safest as well as most remunerative fields of investment. It seems to me, therefore, that these new relations, which are daily increasing, must be mutually profitable. It is also true that the new relations with transmission systems, the various forms of distributing systems, joint operation in combination with railway systems, will enable electric companies to broaden their field of operation, and these features will all be helpful to it in enabling the supply company to generate its product at reduced cost. I know of no body of men which could so successfully handle these new demands, assimilate, co-operate with or become an adjunct to new interests and broaden the field of industrial enterprise as the men constituting the administrative and technical staffs of the companies that are members of this Association. The readiness with which the Edison companies have assimilated new systems, the fertility of resources they exhibited in combining with other systems, retaining what was best, discarding the less satisfactory features, often modifying or even entirely changing the strictly Edisonian point of view, where contact with other systems and other apparatus showed this to be of advantage in meeting the new situation, these qualities of the organization, system, and equipment which the Edison companies displayed, is sufficient refutation of the statement one hears now and then, that the Edison companies are narrow-

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viewed, ultra-conservative and non-progressive, adhering to antiquated traditions and slow to rise to the new responsibilities.

We claim that this Association can with pride assert itself to have been the pioneer in developing broad lines, and the uniform success of the Edison companies which are members of this Association, amply demonstrate the excellence of the lighting and power system with which we began our development, and the faithful energy with which the business has been pushed.

I would refer to the fact that the Association has enjoyed the sympathy and good will of the press, notwithstanding the fact that we have supplied it with only brief reports of our conventions or business proceedings, many of the papers presented and the discussion thereon being in great measure of a confidential character. The good work we are doing, and its advantage to the industry at large, have however secured us the sympathy of the press, a substantial aid in the prosecution of any undertaking, in the benefits of which the public has a share.

While the few remarks I have made are hardly such an address as you may have expected, or as I should have desired to present, I hope they will be helpful to you in obtaining a just and adequate idea of the work which the Association is doing and what it may be called upon to undertake, and they may stimulate the mutual co-operation of our members and the interchange of information to our mutual benefit.

THE SEARCHLIGHTS AND LIGHTHOUSE OF THE EIFFEL-TOWER AT THE PARIS EXPOSITION.

(Translated for ELECTRICITY, from "La Vie Scientifique, Paris, France.)

At nightfall every day, thousands of electric lamps besides the gas and incandescent burners and the acetylene light convert the Paris Exposition grounds into a regular luminous palace which looks from a far distance like an immense fire. The Eiffel Tower only, which is just as attractive as formerly, detaches its astonishing silhouette from the sky and its lantern projects the national colors in all directions, while three powerful searchlights overflow the city of Paris with their luminous effects, thus increasing the general illumination.

The most powerful of these searchlights (Fig. 1) is located on the northeast side of the tower and can send its rays in an angle, the extreme limits of which are the Arc de l'Etoile (star arch) and the Esplanade des Invalides. This searchlight is of the Mangin spherical reflector system, same as the other two. It is fed by a current of 2000 amperes and illuminates the objects with an intensity equal to that of the sunlight within a radius of 10 kilometers. The electrical power station for these searchlights is located at the south end of the tower.

The reflectors of the other two searchlights (Fig. 2) have only 90 centimeters of diameter; one of them is in a fixed position on top of the allegorical group which crowns the front of the Chateau d'Eau, while the other one, mounted upon rails, is movable and changes its position by the hand movements of an operator, its angle of projection being limited by the Trocadero, extending as far as Auteuil. Both searchlights are placed on the roof of the platform of the third story, about 12 meters below the lantern. They are operated by a current of 110 amperes and constructed by Messrs. Sautter Harlé & Co., who have also constructed the third most powerful one.

The luminous focus in these apparatus is located near the reflector and the carbons, which have a diameter of 4 centimeters, are inclined at an angle of 45 degrees. The lantern which

FIG. 1.—THE LARGE SEARCHLIGHT ON THE EIFFEL TOWER.

crowns the building is exactly 300 meters above the ground. It is formed by an electric automatic lamp, the carbons of which have a diameter of 3 centimeters and are encircled by lenses arranged in echelons. Above them are dioptrical glasses for the purpose of carrying the light very far while the total reflection is produced by an arrangement of catadioptrical glasses below. The electric arch gives 5,500 carcels, but owing to the arrangement of the

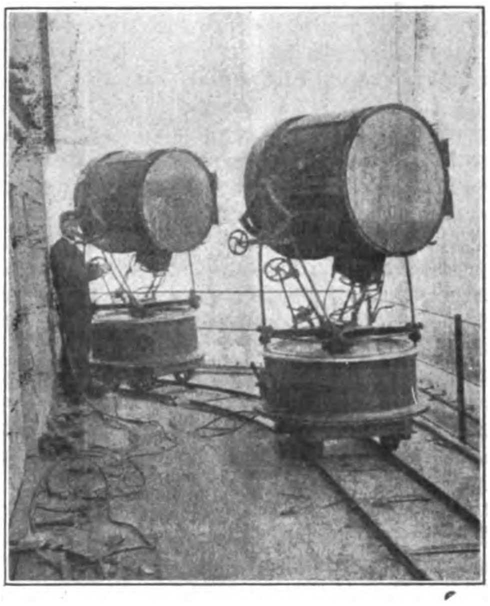

FIG. 2.—THE MOVABLE SEARCHLIGHTS OF THE EIFFEL TOWER.

different systems of glasses which encircle it, this luminous capacity is increased to about 100,000 carcels within a radius of 2,500 meters.

Contrary to the general belief it must be stated that the optical arrangement is fixed, and the turning movement as it appears to the eye is obtained by means of an exterior movable drum carrying vertical stripes of blue, white and red glass which are separated by dark panels. This drum is driven by a small electric motor and performs a revolution in 90 seconds.

The current necessary for feeding the searchlights and the lantern is furnished by the power station located in the southern pillar of the tower and special conduits connect each of the above apparatus to the electro-generating machinery.

There are other lanterns and searchlights on the roofs of private buildings which cross their light effects with those originating on the Eiffel Tower, contributing thus to increase the general illumination of the Exposition grounds.

Among the most important we mention the Katsépé lantern, the searchlight of the Optical Palace, the small searchlight of the Lefevre-Utile Building, and the great projector on top of the German Palace of Navigation and Commerce, which is controlled directly by the German Department of the Army and Navy Palace.

THE UTICA MINES' ELECTRICAL POWER PLANT.*

Eight miles northeast of Angels Camp and about one and one-half miles east of Murphys in Calaveras County, Cal., the Angels Electric Light & Power Company is operating a power plant which furnishes power for the famous Utica mine, which for years had an annual production of between five and six millions in gold, and has thus attained the reputation of having the largest output of any California gold mine. The stock of the Angels Electric Light & Power Company and of the Utica Gold Mining Company and the Hobart Estate Company is all held by practically the same individuals, though each corporation maintains a distinct organization. Students of the use of electrical power in mining operations have recently been giving considerable attention to the power plant in question, and C. E. Heise, the engineer who supervised the installation, has frequently been called upon to describe the interesting plant. J. Frank Gurney recently wrote a valuable description of the plant for the "Journal of Electricity, Power and Gas," to which we are indebted for the information contained herewith.

Water for the operation of the plant, writes Mr. Gurney, is obtained from the ditch of the Union Water Company, also owned by the Utica and Hobart Estate companies, and its reservoirs are situated in Silver Valley, Alpine County, where a reserve capacity of 1,000 miners inches for seventy days is available. During the greater part of the year the water is taken out of the north fork of the Stanislaus River, the reservoirs being drawn from only when the flow of the river decreases to an amount less than that necessary for the operation of the plant. A flume five and three-quarter miles long takes the water from the river and delivers it to a ditch that is twenty miles in length. This ditch terminates in the penstock, which is noteworthy in that it is divided into two compartments that are so connected by gates that either compartment may be drained and cleaned without shutting the plant down. Each of these compartments is connected to the main pipe line through its respective upper leg of the "Y" that is placed

* From the "Mining and Metallurgical Journal."

at the upper end of the pipe line. The pipe line is 1,550 feet in length, with diameters ranging from thiry-six inches at the top to twenty-eight inches at the bottom. The true head is 536 feet, and the effective pressure at the wheels is 225 pounds per square inch.

The power house is a substantial structure of lava built on bedrock, and all foundations are of dyke laid on bedrock in strong cement. The building at present measures fifty by thirty-seven feet with one end unfinished to allow of an addition to accommodate more generators. As it stands at present, the plant is arranged to house only the two complete units that are now installed.

These units each consist of a 750-kilowatt, 500-volt, two-phase, 7,200-alternation revolving armature type alternator, running at 400 revolutions a minute from a 1,200 horse-power water wheel by direct connection; two 375-kilowatt, oil insulated transformers stepping up from 500 volts two-phase to 16,500 volts three-phase; a separately-driven exciter, together with the usual forms of switchboard panels, high-tension switches and fuses and the Wurts non-arcing lightning arrester system. When completed, the power house will contain three such units. In addition to the transformer equipment given above, one special transformer has been installed for use in emergencies. This special or spare transformer is so arranged that it can be substituted for any other step-up transformer, should it become necessary.

If it be necessary to cut out transformer B, the three main switches through which its secondaries are thrown on to the main high-tension bus bars are opened and the five switches connnecting the secondaries of the special transformer to the same bus bars are closed, and power is delivered to the line as before. The spare transformer may be run in parallel with either transformer A or B, and ordinarily the load may be transferred from any transformer to the spare transformer without interruption to the service. The spare transformer is of the same capacity as the standard ones and its distinguishing feature rests in the fact that its secondary carries four taps from which are taken two 100 per cent. one fifty per cent. and one 86.7 per cent. leads. The wiring and switches for the same appear supported on timbers imbedded in the wall back of and above the bank of transformers.

The line consists of No. 1 B. & S. gauge hard-drawn copper, and the wires are strung on one side of the pole to allow a second line being built at some future time. Triple-petticoat glass insulators, guaranteed to stand 25,000 volts are used, and the pins are of eucalyptus boiled in paraffin. All cross-arms are painted with P. & B. paint. The poles are set forty to the mile, and are thirty feet, forty feet, and, at road crossings, fifty feet in height.

The sub-station at Angels Camp contains lightning arresters, high-tension switches and fuses controlling all the high-tension feeder circuits for the mines operated therefrom; also high-tension switches and fuses for the sub-station transformers, which at present consist of two three-phase to two-phase, seventy-five kilowatt, air-cooled, oil-insulated 15,000 to 400 volt transformers, supplying current to a 150 hp. type "C" induction motor driving the Stickle mill; two three-phase to two-phase 150 kilowatt lowering transformers of the same class as the above, but reducing from 15,000 to 2,000 volts for supplying current for the operation of a 150 horse-power, type "C" motor at the Utica mill and also furnishing 150 kilowatts for the operation of the alternating current arc and incandescent lighting of the town of Angels Camp. These local lighting circuits are controlled by a separate switchboard located in the sub-station. Four other seventy-five kilowatt transformers, accompanied by four booster transformers, are also installed and are delivering power to the Calaveras lines of the Standard Electric Company of California for the lighting of San Andreas, Mokelumne Hill, Jackson, Sutter Creek, Amador City and smaller towns.

From the sub station at Angels Camp another three-phase line is run to the Lightner mine where a 100 horse-power, type "C" induction motor drives a forty-stamp mill, and a 150 horse-power induction motor of the same type and make drives an air compressor from which is operated all hoists and drills used in the Lightner mine. A second high-tension line runs from the sub-station to the Gold Cliff mill of the Utica company and supplies power through lowering transformers to a 75 horse-power, 400 volt, type "C" induction motor that is used for running the forty stamps and concentrators in the mill. All these installations are highly successful in every way.

It was in 1893 that the progressive owners of the Utica properties found that the high price of fuel compelled them to investigate the possibilities of electrically transmitted power for their mine. Two years later they put up a small plant, which gave them excellent lighting facilities and also enabled them to study the applications of electricity to their properties. The original plan was a modest little house, which, however, answered its purpose so well that the managers were induced to put up a much larger building well equipped with the best modern electrical machinery, which we have described.

The Electrical Treatment of Tuberculosis.

The medical faculty of Paris, says the Washington "Times," is devoting considerable attention to a new cure of tuberculosis through the transfusion of microbe-destroying drugs by means of electrical currents passed through the patient's chest and lungs. The discovery of the treatment, which has been submitted to severe tests at Paris and Bordeaux during the last four years, is attributed to M. Francisque Crotte, of Paris, and exhaustive reports on the results of these experiments were read before the International Medical Congress recently by Dr. Bertheau, medical delegate to the congress from the city of Paris, and by Dr. Ducamp, delegate to the congress from Bordeaux. A third paper on the same subject was submitted to the congress by Dr. Labadie, who attended the congress as a delegate of the Medico-Legal Society of New York.

The conclusions of the three reports are emphatically in favor of the new treatment, and this view is shared by Prof. Virchow, of Berlin, and by Dr. Brouardel, of Paris, who predict that the treatment is likely to receive the sanction of the medical faculties of Paris and Berlin for adoption in the public hospitals of those cities.

The Paris physicians consider that M. Crotte's discovery may have far-reaching consequences, for it enables extremely powerful antiseptics to be introduced into the human system and permeate the tissues and even the bones, so that the bacilli may be killed without injury to the patient, which would result if the same drugs were absorbed by the system through the stomach or by other means hitherto employed. Long series of experiments have convinced the physicians here that a solution of formol, known as formaldehyde, containing iode and mercury, is absolutely fatal to the bacilli of tuberculosis, even when applied in the form of vapor. This exceedingly powerful antiseptic cannot without great danger be taken through the stomach, and the reports submitted to the Medical Congress by Drs. Bertheau, Ducamp and Labadie show that by static electricity the vapor of formaldehyde has been transfused into the tissues of the chest and lungs, thereby destroying the bacilli of tuberculosis and preventing reproduction in their tubes of cultivation.

Since M. Crotte communicated the theory of his discovery to the French Academy of Science in 1894, 800 tuberculosis patients in France have been treated by his method and 600 of these have been completely cured. The number of patients whose treatment has been set forth in "clinical" detail by the reporting physicians and submitted to the congress is 42. Of these, 10 were reported upon by Dr. Bertheau, 11 by Dr. Ducamp, and 21 by Dr. Labadie. All the cases known to have been treated by the new method are divided into three categories: first, patients who are in the first stage of tuberculosis; second, those who have reached the second stage, and third, those where the progress of the disease is so advanced that under ordinary circumstances they would be considered incurable.

LONDON NOTES.

[From our London Correspondent.]

The New Generating Station of the City and South London Railway.

Now that the great excitement created by the inauguration of the Central London Railway has to some extent subsided, engineers are turning their attention again to the City & South London Railway, which has equipped a new generating station at Clapham on very different lines from those adopted for the original station opened in 1890, and from the system employed by the Central London Railway at Shepherd's Bush. The great point of difference, appealing to engineers in this country, is found in the fact that the power station of the Central London Railway is American from top to bottom, while that of the City & South London is developed and equipped on exclusively British principles, with British made machinery. The old generating station, which did ten years' good service, although its machinery naturally was not quite so economical as was desired, is now to be used for tool and repair shops. All of the original machinery has been disposed of with the exception of one 125 kw. Siemens-Willans set, which is now doing service in the new station, together with two 300 kw. high-speed Siemens-Willans sets, and two 800 kw. steam generators with Corliss compound engines with very heavy fly wheels, driving Electric Construction Company's generators, which are compound wound to maintain a constant potential of 500 volts at the switchboard. Surface condensing plant and Klein's cooling towers are installed. The system of distribution is of great interest. The three-wire system was adopted by the officials after careful consideration of the objections which had been stated against it for service of

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this kind. On the original line the ordinary two-wire system was employed, but when the extensions were taken in hand it was considered no longer suitable on account of the return drop in the rail and the loss in the feeders. The three-wire system with balancers was adopted, and the officials assert that the first few months' working has been quite satisfactory. The running rails form the middle wire, and the working conductors in the tunnels the outers, with a difference of 1,000 volts between, namely, 500 volts between the working conductor and the running rail in each tunnel. The working conductor in each tunnel is fed to three points, namely, Stockwell, Kennington and London Bridge. The Kennington feeder is coupled through a booster to compensate for the drop in the feeder. At London Bridge the battery sub-station and reducers maintain a constant potential. From the main board at Stockwell the London Bridge substation is fed on a five-wire system, a motor generator being placed between the bus bar and the high tension feeder, adding 500 volts to the feeder. At the London Bridge substation there is a battery of 556 Tudor accumulators. At the stations at Moorgate street, the Elephant and Castle, and Clapham Common balancers are placed, each of which is capable of dealing with a load of 160 to 200 amperes, concentrated on one side of the system.

The boilers are nine in number, of the Davey-Paxman "Economic" type, 15' 6" x 8' 9". Vicars' mechanical stokers are fitted to each.

Mr. P. V. McMahon, the chief engineer to the company, designed the power station and its equipment, and the work was of course carried out under his supervision.

LEGAL NOTES.

Judge Pollock recently handed down a decision in the case of the Fargo (N. D.) Gas and Electric Company against the Fargo Edison Company, favorable to the latter. The former company claimed an exclusive and perpetual franchise, granted in 1881, and sought to prevent the Fargo Edison Company from erecting poles and stringing wires. A temporary injunction had been issued to that effect till the case could be heard on its merits. Judge Pollock holds that the original company has no exclusive franchise and also dissolved the injunction against the Fargo-Edison people. The case will be appealed to the Supreme Court. Much of the trouble started over the poles. The telephone company has one side of the street and the light companies are fighting for the other. The old company claims damages by induction from the wires erected by the Fargo-Edison Company.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended September 13:

Aberdeen, 3 cases, $400; Antwerp, 23 cases, $4,034; 1 case motor trucks, $25; Australia, 257 cases, $15,770; 270 trolley poles, $9,700; 600 cable reels, $32,800; Brazil, 7 cases, $1,324; Bristol, 86 packages, $10,135; 26 packages electric cables, $4,433; British East Indies, 25 packages, $1,334; British Guiana, 26 packages, $786; British Possessions in Africa, 44 packages, $2,966; British West Indies, 7 packages, $131; Cantillana, 63 cases, $12,504; Central America, 69 cases, $1,057; Chili, 1 case, $24; Copenhagen, 6 cases electric cranes, $1,400; Cuba, 42 packages, $1,834, 8 cases, $173; Dutch East Indies, 6 cases, $261; Dutch West Indies, 2 packages, $38; Ecuador, 1 case, $15; Glasgow, 54 packages, electric cable and fixtures, $14,085; 5 cases, $89; Hamburg, 1 motor car, $915; Havre, 109 cases, $5,162; 8 cases insulators, $312; Hull, 1 case motors, $180; Japan, 111 cases, $18,971; 7 cases motors and parts, $1,006; Jarrow, 52 packages, $10,600; Leghorn, 1 case, $15; Liverpool, 54 cases, $3,411; 75 cases trolley poles, $2,200; London, 136 cases, $14,047; 14 cases motors, $803; Madrid, 25 cases, $3,900; Manchester, 1 case, $300; Marseilles, 9 cases, $762; Mexico, 101 cases, $1,479; Newcastle, 32 packages, $1,650; New Zealand, 5 cases, $82; Peru, 58 packages, $990; Philippines, 42 cases, $6,125; Porto Rico, 20 packages, $455; Riga, 25 cases, $429; Siam, 23 packages, $395; Southampton, 1 case, $190; 11 packages, $556; St. Petersburg, 1 case motors, $145; Tynemouth, 2 cases, $200; U. S. Colombia, 8 packages, $605; Venezuela, 71 packages, $126.

PERSONAL MENTION.

Mr. John I. Beggs was lately chosen president of the Appleton (Wis.) Electric Company.

Mr. Roland T. Carlisle, formerly of Buffalo, N. Y., but for the past two years connected with the Western Electric Company of New York, died in this city last week of typhoid fever.

Mr. Frank S. Bloodgood, for many years the manager of the Owego (N. Y.) telephone exchange, but for the past year relieved from duty, will be reinstated as manager in about a week.

INCORPORATIONS.

The Sherburne Electric Light & Power Company, Sherburne, Minn. Capital stock, $15,000.

The Acme Electrical Company, Philadelphia, Pa.—to deal in electrical supplies. Capital stock, $100,000.

The Sunbeam Incandescent Lamp Company, Glenridge, N. J. Capital stock, $150,000; capital in Illinois, $38,000.

The Electropulsion Company, Newark, N. J.—to apply motors to vehicles. Capital stock, $100,000. Incorporators: A. G. Voght, F. K. Irving, L. S. Mott and others.

The General Light & Power Company, Charleston, S. C.—to do a general electric light and railroad business. Capital stock, $5,000,000. Incorporators: M. J. Hogan, T. J. Begley, T. F. Daley, L. H. Cohen and A. Preston, all of Philadelphia, Pa.

The Grand Rapids Company, Grand Rapids, Mich.—to do a general railroad and telegraph business. Capital stock, $5,000,000. Incorporators: J. P. Rinn, J. F. Hill, T. F. Shanlan, F. L. Drew and A. Smith, all of Boston, Mass.

The Westville Electric Light & Power Company, Danville, Ill.—to operate an electric light, power and steam plant. Capital stock, $20,000. Incorporators: M. Kelly, W. M. Kelly and E. J. Kelly.

The Howard Electric Company, Kansas City, Mo. Capital stock, $20,000. Incorporators: James H. Howard, W. S. Voigt, W. P. Robinson, Jr., W. L. Poffenbarger and Edward L. Massie, all of Kansas City.

The Troy Electric Leasing Company, Troy, O. Capital stock, $25,000. Incorporators: C. C. Hobart, Walter H. Colis, Herbert L. Johnson, Adeline S. Johnston and Ida Rhodes.

The Light Weight Battery Company, Newark, N. J.—to deal in electric batteries, etc. Capital stock, $500,000. Incorporators: A. G. Voght, F. K. Irving, P. T. Austen, H. Tuttle and L. S. Mott.

The Alden Electric Company, Chicago, Ill.—to do a general manufacturing and mercantile business. Capital stock, $12,000. Incorporators: Fred H. Alden, J. Schlesinger and Jacob Geiserowich.

COMING ELECTRICAL EVENTS.

American Electro Therapeutic Association—Will meet in New York City Sept. 25-27, 1900.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

National Association of Municipal Electricians—Will meet in Pittsburg, Pa., Sept. 25-27, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED SEPTEMBER 11, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

657,628. Ice Removing Trolley for Electric Railways. John J. Shirkey, Chicago, Ill. Filed April 30, 1900.

657,637. Trolley-Head, Stanislas Bourgeois, Manchester, N. H. Filed April 10, 1900.

657,730. Electric-Railway Signal. George H. Dunham, Quincy, Mass., assignor of one-half to Elmer H. Heath, Boston, Mass. Filed Nov. 11, 1899.

657,757. Electric Bond for Railway-Rails. Harold P. Brown, Montclair, N. J. Filed Feb. 18, 1899.

657,830. Conductor and Collector for Electric Railways. Arthur Petzenburger, Berlin, Germany. Filed Dec. 8, 1899.

657,887. Electric Train-Signal Device. James F. Scullen, Chicago, Ill. Filed Jan. 26, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

657,541. Device for Fixing Incandescent Electric Lamps. Louis J. P. Hollub and Henri Mignal, Paris, France. Filed May 29, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

657,703. Electrical Rheostat. Harry W. Leonard, New York City. Filed Feb. 11, 1899.

657,760. Electric Igniter for Explosive-Engines. Isaac H. Davis, Boston, Mass., assignor of one-half to E. D. Mellen, Cambridge, Mass. Filed Nov. 18, 1899.

657,795. Electric-Circuit Closer for Looms. Harry W. Smith and William H. Redding, Worcester, Mass. Filed July 13, 1898.

TELEPHONES AND TELEPHONE APPARATUS.

657,854. Combined Telephone Signal and Jack. Oren R. Cline, El Dorado, Kan. Filed Feb. 6, 1900.

MISCELLANEOUS.

657,516. Motor-Vehicle. Clyde J. Coleman, Chicago, Ill., assignor, by mesne assignments, to the General Automobile Company of New Jersey. Filed Oct. 27, 1899.

657,527. Process of Making Metallic Duplicate Phonograph-Records. Thomas A. Edison, Llewellyn Park, N. J. Filed May 4, 1900.

657,574. High-Voltage Insulator. Alf Sinding-Larsen, Frederiksvaern, Norway. Filed Dec. 11, 1899.

657,638. Secondary-Battery Plate. William Bowker, Sr., Waltham, Mass. Filed Jan 19, 1900.

657,646. Apparatus for Reclaiming Tin and Zinc from Tinned and Zinc Scrap. George B. Cruickshank, Birmingham, Herbert R. S. Coleman, Smethwick, and Percival Cruickshank, Birmingham, England. Filed May 28, 1900.

657,650. Automobile Vehicle. Leonard H. Dyer, Washington, D. C., assignor of one-fourth to Frank L. Dyer, Montclair, N. J. Filed June 8, 1898.

657,659. Secondary Battery. Augustus Jamieson, Elizabeth, N. J., assignor of three-fifths to Sydney H. Carney, Henry E. Knox and William Watt, New York City. Filed Nov. 18, 1897.

657,678. Secondary Electric Clock. George P. Rose, Jr., Dubuque, Iowa, assignor to Barnim L. Behrendt, New York City. Filed Oct. 30, 1899.

657,694. Electric Clock. George Fichter, Lynn, Mass. Filed Jan. 10, 1900.

657,711. Motor-Vehicle. Francis E. Stanley and Freelan O. Stanley, Newton, Mass., assignors to the Stanley Automobile Company of New York. Filed Oct. 16, 1899.

657,722. Means for Controlling Excitation of Boosters or Generator Fields. Joseph Appleton, Philadelphia, Pa., assignor to the Electric Storage Battery Company, Gloucester City, N. J. Filed March 30, 1899.

657,731. Graphophone-Clock. John F. Eldred, Chicago, Ill. Filed Oct. 28, 1899.

657,732. Coupling for Electric Conduits. Edward S. Francis, Hartford, Conn. Filed July 6, 1900.

657,736. Electric Furnace. William S. Horry, Sault Ste. Marie, Mich., assignor to the Union Carbide Company, Chicago, Ill. Filed Nov. 23, 1897.

657,771. Transmission Device for Motor-Cars. Fritz Henriod Schweizer, Marin, Switzerland. Filed April 12, 1900.

657,782. Electric Elevator. John W. Mabbs, Chicago, Ill. Filed July 26, 1897.

657,785. Phonograph. Ademor N. Petit, Newark, N. J. Filed Oct. 27, 1899.

657,804. Tip for Commutator-Segments. Anton R. Westerdahl, New York City, assignor to the General Electric Company of New York. Filed May 31, 1900.

657,828. System of Multiple-Rate Metering. Eustace Oxley, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 31, 1899.

657,829. Multirate-Meter. Eustace Oxley, Lynn, Mass., assignor to the General Electric Company of New York. Filed Aug. 7, 1899.

657,853. Electric Lock. Henry G. Carleton, New York City, assignor to the Carleton Electric Company, same place. Filed Jan. 13, 1900.

657,855. Frictional Driving Gear. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan, New York City. Filed Jan. 12, 1900.

657,861. Electric Measuring and Indicating Apparatus. Horace Darwin, Ernest H. Griffiths and William C. D. Whetham, Cambridge, England. Filed May 29, 1900.

657,892. Electrically-Actuated Safety-Device for Elevators. Nelson B. Keyser, Philadelphia, Pa., assignor to Marcus B. May, Winchester, Mass. Original application filed Oct. 17, 1893. Divided and this application filed Oct. 29, 1897.

657,899. Motor-Vehicle. Clyde J. Coleman, Chicago, Ill., assignor to Thomas J. Ryan, New York City. Filed Dec. 8, 1899.

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THE TELEPHONE WORLD.

Independent Telephone Companies in the South.

The combined interests of the independent telephone companies of the States of North and South Carolina are making a fight against the Bell Telephone Company in the above territory in the line of business competition. The independent interests are strongly organized as the "Independent Telephone Association of the Carolinas," with W. B. Moore, of Yorkville, S. C., as president.

The independent lines have been in existence for about four years and represent in round numbers about $1,000,000. In many toyns the franchises of the independent companies hold them to stipulated rates, which, they claim, are lower than the Bell rates wherever the two companies have come into competition, and it is further claimed that as a result the Bell Company has been compelled to lower rates, in some instances 50 per cent., in order to compete with the independent lines.

One hundred cotton mills in the Piedmont section of the Carolinas are connected together by the independent lines, and it is claimed that these lines are an important factor in the development of this as yet only partially developed territory. The independent lines have grown in numbers, from a small beginning to 125 separate lines, with a total of 12,000 'phones.

It is claimed by the independent men that they have a more comprehensive service than their competitors in that territory. In addition a movement is now on foot to organize the separate independent lines into a company, having headquarters at Spartanburg, Columbia, Charlotte and Greenville, and the object is to obtain a service which shall give the telephone subscribers a service embracing the entire independent system.

The Rome (N. Y.) Home Telephone Company's plant is in operation—not only in operation but successfully so. With the improved switchboard, long distance telephones and two wire system the people of Rome have a telephone system that is beyond compare. The switchboard is said to be one of the finest in the State. The board is equipped complete for 700 telephones and so arranged that the ultimate capacity will be 1,000 'phones. At present the directory of the company shows that there are 275 'phones ready to be connected up and the officials are very much pleased with the prospect. New subscribers are being secured at the rate of five per day and without doubt the company will have from 400 to 500 subscribers connected by October 1. In a recent interview, an official said: By September 20 the Home Telephone Company will have its toll lines completed from Rome to Camden, Taberg, Oneida, Verona, Vernon, Verona Springs, Clinton, Clark's Mills, Kirkland, Waterville, Oriskany Falls, Deansville, Lowell, McConnellsville, Blossvale, Stittville, Holland Patent, Boonville, Lee, Lee Center, Lorena, Point Rock, West Leyden, Constableville, Delta, Lowville, Lyon's Falls, Vienna, West Branch, West Leyden and almost every postoffice in Oneida and Lewis Counties. In Oneida County the company connects with the exchange of the Camden Telephone Company, which has 100 subscribers in Camden, the exchange of the Clinton Telephone Company with 100 subscribers, the exchange at Boonville with 100 subscribers and with exchanges at Waterville and Oriskany Falls with 200 subscribers. Before October 1 the long-distance copper lines of the Rome Home Telephone Company and the Syracuse Telephone Company will be connected at Oneida, which will give this company service with 2,000 subscribers of the Syracuse Company, and to all towns reached over the Syracuse system.

A contract was recently let by the new Union Telephone Company of Glens Falls, N. Y., to the Eastern Electrical Construction Company of Philadelphia for the equipment of its system, which will include toll lines to Troy or Albany and Luzerne, Corinth, Lake George, Warrensburg, Chester, Ticonderoga, Schroon Lake and other northern towns, and also Granville, Cambridge, Salem, Castleton and other towns in Washington County and Western Vermont. About 4,000 poles will be required. The cost of the plant will be more than $100,000. The switchboard will have a capacity of 1,500 telephones and all will be long-distance instruments. It is expected that the plant will be ready for use not later than January 1.

The telephone committee of the board of aldermen of Worcester, Mass., will have the franchise of the Citizens' Telephone & Telegraph Company ready this month. The work of the committee goes on smoothly and the members are agreed on every vital point. The preparation of such a franchise requires careful work and naturally takes considerable time.

Work has begun on the spur of the telephone line which will connect Chili Station, N. Y., with the main line.

Telephone Competition.

The right of telephone competition in Kansas City, Mo., is undoubted. The value and expediency of two systems is a matter which is apparently about to be demonstrated. The long fight in the council on this question was terminated a short time ago by the passage in the lower house of the ordinance granting a franchise to the Missouri Interstate Company.

All possible care seems to have been taken in the preparation of the ordinance to prevent the consolidation which usually follows the attempt to establish competition in public utilities. The new company has placed itself under the strongest possible promises to redeem its pledges, and the mayor and the council are, apparently, fully satisfied as to the sincere business intentions of the rival corporation.

The practical result of two telephone companies in Kansas City will be awaited with a blending of curiosity and apprehension that it will carry with it some annoyance with its anticipated benefits. Outside of the persons personally interested in the scheme, competition was favored only as a means of curing the defects in the service of the Missouri & Kansas Company. Had this been satisfactory as to quality and cost there would have been no effort made to establish a rival system. "In such a public utility as telephone service monopoly seems to be almost a logical condition," says a Kansas City paper. "There is needless expense and trouble in maintaining two machines, which would seem to be a necessity where there are two companies. Competition gave Kansas City dollar gas. Whether the same expedient will improve its telephone service is something that remains to be discovered."

The Mutual Telephone Company has made a liberal reduction in tolls on the Winston and Elkin, N. C., line. They are now probably not more than one-half the usual charges for same distances. The company hopes by this means to encourage the public to use the service freely. In order to make the service more satisfactory it has been found necessary to establish stations for use of the public in different parts of Winston.

The Missouri-Kansas Telephone Company of Wichita, Kan., is rushing the work in the placing of its new switchboard in position. The work will be entirely completed by the latter part of the month and Wichita's service will be in splendid condition. New cables for the business there are being put up and each contains ten wires.

A short time ago the officials of Williamsport, Pa., and the North and West Branch Telephone Company, met at the city hall, in accordance with their advertisement, to hear complaints of people who did not want the poles for the new line placed in front of their homes. No person put in an appearance, and consequently it is supposed that nobody will complain. The work of erecting the poles will begin soon.

The lines of the Ansonia, Conn., Telephone Company, a local system in operation in Ansonia, Derby, Shelton, Seymour and Oxford, and those of the local system of Woodbury, operating in Woodbury, North Woodbury, Hotchkissville, South Britain, Southford and Southbury, were connected recently in Oxford after the stringing of seven miles of wire. This establishes long distance communication between the two systems. The wires are working well and conversation is surprisingly distinct.

The wires of the Rochester, N. Y., Telephone Company in the outskirts of that city were somewhat damaged by the recent wind storm. No serious damage was done, however, as most of the wires of the company are underground and were not affected by the storm. Under the direction of Superintendent of Construction C. O. Harris the wires were put in shape, and all the 'phones of this company are working in the usual manner.

The East Tennessee Telephone Company is making many improvements in its plant at South Pittsburg, Tenn. The company has a force of men engaged stringing twenty wires between South Pittsburg and Jasper. The same number of wires will be placed between South Pittsburg and Bridgeport, Ala. When these improvements are completed subscribers in the three towns can talk to each other without additional cost.

The question of the site for the new Holyoke, Mass., telephone exchange has been decided, and a fine fireproof central exchange will be built as soon as plans can be furnished. The cost of the building with switchboards and connections will be about $60,000.

The telephone line from Oakland, Ore., via Stephens, Umpqua Ferry and Coles Valley to Millwood, promises to be a sure thing.

The manager of the Springfield, Mass., division of the New England Telephone Company has notified manager Bradley of the Pittsfield, Mass., district, of an entirely new plan to secure new subscribers to the service of the company in Pittsfield. The plan is to give the use of metallic circuit, long distance transmitter telephones on party lines to merchants and resident property owners for a period of four months. This of course is offered only to those who have not telephones at their residences. Canvassers are to shortly arrive in Pittsfield, and will make the round of the business houses of the city. Any reliable merchant who wants a telephone placed at his residence for a period of four months can do so. If at the end of that period he finds that the telephone is of no service to him the company will take out the 'phone, and the trial service will not cost him anything. If he is satisfied with the trial that the 'phone has been of service and desires to retain the use of it he will be required to sign a year's contract with the company.

There is every indication that the People's Telephone & Telegraph Company of Knoxville, Tenn., is preparing to greatly enlarge its toll line territory within the next few months. The company held its annual meeting a short time ago, and the officials at that time would give out no information as to what was done, except as to mere routine matters. It had been stated previously, however, that a decision had been reached to add to the territory already covered by the company's wires and the wires of the independent companies with which it has toll line connections, and this policy has, in fact, been carried out steadily for the past two years. It was learned recently on the highest authority that a new system is being put in at Louden, Tenn., and a gang of workmen, also employes of the People's Company, is at work in Williamsburg, Ky., where a similar exchange is being put in. It is understood also that the Lexington, Ky., independent telephone company is making large contracts for poles, to be delivered not later than October 1, and that a new exchange is to be put in there as soon as the materials can be gotten on the ground. Later, toll line connection will be established with Williamsburg.

The Bell Telephone Company, which includes the Ridge Road in West Seneca, N. Y., in its Buffalo district, has received many complaints of late from subscribers over the ervice furnished, and in most instances the complaints have been fully justified. On many days during the last six months the lines have been out of order, and at other times there has been such a buzzing noise on the line when a receiver was held to the ear that it was impossible to hear any conversation. Another disagreeable feature commented upon mostly by the women of the households supplied with telephones is that strange men have been calling at the houses every few days on one pretence or another to repair or look at the telephone. It has been very seldom that the same man called twice. The Bell Telephone Company, realizing the force of the complaint made by the women, has given to each of its employes a card stating that they are in the employ of the Bell Telephone Company, which the employes are expected to show before entering a house.

The wires of the New Augusta, Ind., Telephone Company were lately connected with Indianapolis, through those of the New Telephone Company. The New Augusta Company now has about twenty-five miles of wire stretched. It connects with several junctions in the oil fields near Broad Ripple. The line will soon be extended to Trader's Point and Flackville. It is a recently organized concern. William B. McDonald is president.

The new telephone line from Ebenezer to Beaver Ridge via Cedar Bluff and Ball Camp, Tenn., was opened for business a short time ago. The line is a part of the East Tennessee Telephone Company's long-distance toll system.

The business men of Norfolk, Va., are certainly interesting themselves in the telephone situation. Committees are investigating the question of rates, and the result no man knows. Each of these committees means business, and when they report it will be interesting.

The Oregon Telephone Company gives notice that an office has been opened at Crawfordsville, Ore.

TELEPHONE INCORPORATIONS.

The Massillon Telephone Company, Massillon, O. Capital stock, $75,000.

The Athens County Telephone Company, Athens, O.—to construct and operate a telephone line. Capital stock, $15,000. Incorporators: C. L. Jones, G. W. Duffee, W. E. Moler, A. F. Holmes and E. J. Holmes.

The Lawrence Telephone Company, Ironton, O. Capital stock, $24,000.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Bryant, S. D.—W. Denevan has submitted a proposition to the citizens of this place to put in and operate an electric light plant.

Butte, Mont—The Butte "Journal" is agitating the question of an electric light plant to be owned by the city.

Christiansburg, Va—This city will build an electric light plant. D. M. Munroe, engineer of Washington, D. C., has prepared the plans. M. H. Tompkins, mayor.

Coffeyville, Kan.—Coffeyville has voted $20,000 worth of bonds for the purpose of putting in an electric light plant.

Dalton, Ga.—This city has purchased a gas plant and contemplates the erection of an electric light plant as soon as arrangements can be made.

Fayette, Miss—Machinery and fixtures will be purchased for an electric light plant. Address Fayette Oil Works, Fayette, Miss.

Gloucester, N. J—The South Jersey Gas, Electric & Traction Company will soon abandon its Woodbury electric light plant and furnish power for that city from the plant recently acquired here.

Griffin, Ga.—The Griffin Knitting Mills of this city want to buy a dynamo for 100 lights and contract for putting up the plant.

Hawkesbury, Ont.—Alexander Cote, electrician at the Riordon Paper Mills, has recently been canvassing the town with the view of having an electric lighting plant established.

Heyworth, Ill.—Messrs. Blair & Newell of Chicago, will erect an electric light plant here.

Huntington, Ind.—Boyd & Company have made a proposition to the council to erect an electric light plant.

Iowa Falls, Ia.—The Iowa Falls Electric Light & Power Company will reorganize with a capital of $40,000.

Jewett, Tex.—Keeton & Steel of this place are in the market for a new or second-hand 300 to 500 incandescent dynamo.

Laurel, Md.—This city has issued bonds for the building of an electric light plant, and bids will be received by J. C. Howell, secretary of the Laurel water board.

Magnolia, Miss—J. H. Jenks, an electrician from St. Louis, has been looking over this town, and making estimates as to the cost of erecting an electric light plant.

Manitowoc, Wis.—The city of Manitowoc is negotiating for the purchase of the electric light plant.

Marion, Va.—The council has decided that this place shall have an electric lighting system.

Mendon, Mich—The citizens of this place have decided in favor of the municipal ownership of the electric lighting plant, and will issue $8 000 in bonds, payable at the rate of $1,000 per annum.

Normal, Ill.—This town is agitating the queston of owning and operating an electric light plant.

Oxford Junction, Ia—The citizens of this place have voted in favor of granting an electric light franchise.

Pembroke, Ky.—The city council has contracted with Walter S. Bumbus to light the streets with electricity.

Pontiac Mich—J. W. Martin states that the Oakland County Telephone Company, of which he is the manager, is considering the advisability of establishing an electric plant to furnish light, heat and motive power.

Port Huron, Mich.—The City Electric Railroad Company is preparing plans for a new plant to be erected on Beard street.

Reinbeck, Ia.—A party from Davenport wants to put in an electric light plant here.

Sedro, Wash—Shrewsbury & McLain, mill men of this city, intend to put in an electric light and power plant at once.

Sidney, O.—Bids are asked until September 22 for lighting this city for 10, 15 or 20 years from August 1, 1901, requiring about seventy-five 2,000 cp. arc lights. Address F. Mumford, chairman of the light committee.

Stephen, Minn.—The Triumph Electric Company of Cincinnati has been awarded the contract to erect the new electric light plant here.

Sturgeon, Mo.—J. K. Fyfer, of Centralia, is figuring with Col. O. D. Gray and other capitalists of this place upon the furnishing of electric lights for Sturgeon.

Talladega, Ala.—This city will erect an electric light plant.

Thief River Falls, Minn.—At a recent meeting of the city council it was voted to put in an electric light plant.

Weldon, N. C.—A large electric plant will be established on the canal of the Roanoke Navigation & Water Power Company.

West Plains, Mo—Plans are being prepared for the erection of a new electric light plant here.

Wyoming, Ia.—This place has been asked for a franchise to establish an electric light and power plant.

Zanesville, O.—A deal has been completed by which a controlling interest in the property of the Zanesville Electric Light Company has passed into the hands of a Boston syndicate, represented by the International Trust Company of that city.

STREET RAILWAYS.

Angola, Ind.—A special election has been called to be held October 10 to vote on the proposition to vote an appropriation of $20,000 to aid in the construction of the electric railroad projected to be built from here across the Michigan line, with Coldwater as the terminal point.

Battle Creek, Mich.—The right of way for the proposed electric road from this city to Coldwater has been secured, the route selected running through Burlington and Union.

Bryan, O.—Local and Eastern capitalists have practically secured the right of way for a new electric road to connect Toledo with this place.

Columbus, O.—The Columbus, London & Springfield Electric Railway Company has increased its capital stock from $100,000 to $1,000,000. The company is pushing the road to completion in this city, and has about finished its line from Dayton to Urbana.

Gardiner, Me.—The Gardiner Electric Railroad Company will apply for a charter for an electric road to South Gardiner.

Grand Rapids, Mich.—The survey of the route of the proposed Grand Rapids-Holland Electric Railroad has been completed and construction work will begin very soon.

Lebanon, O.—The county commissioners lately granted to J. P. Wolf and W. P. Sunderland a 25-year franchise for building and operating an electric car line over the Dayton, Centerville and Lebanon pike from the corporation line of Lebanon to the north boundary line of the county.

Lenox, Mich.—It is proposed to build an electric road from this place to Sanilac Center, about 40 miles. G. R. Lovejoy, of Mt. Clemens, is interested.

Natick, Mass.—A company is projected to build an electric railroad connecting this place and Sherborn. It will also run to Holliston, making a shorter route to that town from here.

Sing Sing, N. Y.—The authorities are trying to compel the company controlling the trolley road here to put fenders on the cars.

South McAlester, I. T.—The Union Electric Railway Company, lately capitalized at $122,000, will construct and operate an electric railroad through the streets of this town, and one or more lines from here to and through the towns of McAlester, Krebs, Cherryvale, Alderson and Hartshorne, a total distance of twenty-five miles.

Springfield, Ill.—The proposed electric railway between this city and Jacksonville is again under consideration.

West Boxford, Mass.—The proposed electric railroad between Andover and Groveland Bridge, through this town, is being talked of, and when a location is granted the work of building the road will be pushed ahead.

Weyauwega, Wis—A. R. Hutchinson of this place states that surveys have been made and rights of way secured for the proposed line between Berlin, this city, New London and Wautoma about 70 miles long to be operated by electricity.

Whitehall N. Y.—The Whitehall & Granville Railroad Company of Washington County will operate a street surface railroad by electricity or other power, except locomotives, with a capital of $750,000.

MANUFACTURING.

Hamilton, Ont—The Leitch & Turnbull Company, Limited, of which Andrew Leitch is president; Wm. Leitch, vice president; E. H. Thompson, secretary-treasurer; William Turbayne, electrical engineer, and James Turnbull, director, will manufacture elevators and electrical machinery.

New York City.—The Unique Electric Device Company, of which James P Hines, Michael Sorhan and Michael Hines are the directors, was recently organized here to manufacture electric machinery and appliances with a capital of $10,000.

Philadelphia, Pa.—The Navy Department has awarded a contract for the installation of an electrical conduit system at the Washington navy yard to George W. Ledie of this city at his bid of $15 246.

Trenton, N. J.—Charles Smith has taken the old Pope & Lee Pottery on Meade street, and is having it remodeled for the purpose of manufacturing electric supplies.

COMPANY MATTERS.

Clyde, N Y—By order of the Supreme Court, the real, personal or mixed property, effects, assets, privileges and franchises of the Clyde Gas & Electric Company will be sold at 10 A. M. September 26, at the office of the company in this place, by the temporary receiver, Edward Moir.

Niles, O.—The Niles Electric Company's plant was sold here last week by W. G. Hurlburt, receiver, to J. H. Orwig of Niles, the highest bidder; consideration, $1 500.

POWER AND TRANSMISSION PLANTS.

Hanford, Cal—The Mammoth Electric Company has filed upon water rights in the upper San Joaquin River, which it is estimated, at the lowest stage of the river, will develop 55,000 horse power. The cost of installing the plant will amount to upwards of $2 500,000. It is stated that the work of transmitting electric current to San Francisco will soon be under way. H. G., O. M. and R. C. Lacey, S. E Biddle, J. E. Rawlins and others are interested.

Henderson, N. C—The Henderson Power & Lighting Company has lately been formed here, the purpose of which is to build and operate electric light and power plants, to sell and transmit electric current, power, etc., to manufacture and sell ice and conduct a cold-storage plant. Samuel H. Pulliam and E V. Williams of Richmond, Va., and J. H. Bridgers of this city have an interest in the firm.

Redding, Cal.—A fifty-year franchise to conduct an electrical plant and furnish power and lights to mines and the unincorporated towns of this county was sold by the supervisors to A. H. Davidson of San Mateo County.

AUTOMOBILES.

Chicago, Ill.—The Electric Storage Battery Company announces that it has sold the use of its patents for automobile purposes to the Columbia Automobile Company, for which it received $1,000,000 of the latter's $3,000,000 of capital stock. The Electric Storage Battery Company says it has booked orders so far this year amounting to $2,000,000.

Portland, Me—The Waltham Motor Carriage Company has been organized here for the purpose of manufacturing and dealing in automobiles, bicycles and electric goods, with $300,000 capital. W. A. Ingraham of Lowell, Mass., is president, and R. B. Johnson of Waltham, Mass., treasurer.

Springfield, Mass.—J. F. Duryea of this city is president of the Hampden Automobile & Launch Company, organized at Portland, Me., with a capital of $100,000, for the purpose of dealing in automobiles and launches.

Washington, D. C—The American Bicycle Company has entered extensively into the manufacture and sale of automobiles. The electric vehicle is the ideal carriage here for the business or professional man and for ladies' use.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Sept 17.						
United Traction	100	$5,000,000	$5 000,000	1¾ % Q.,	121	121½
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Sept 17:						
Allentown & Lehigh Val. Trac. Co.	..	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Sept 17:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Sept 17:						
aUnited Railways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.—Sept 17:						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
bWest End Street Ry. Co......com	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	144½	145
Brooklyn N. Y.—Sept 17:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	232	234
Brooklyn Rap. Transit Co., tr certif..	100	43,000,000	43,000,000	....	83½	5 ¼
cBrooklyn Heights Railroad	....	200,000	200,000	....	107	109
*dBrooklyn City RR........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
eBrooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	322	325
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
fAtlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
gBrooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Sept 16:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Sept 17:						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Sept 17						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	..
Enterprise City RR. Co	25	1,000,000	250,000	....	--	..
Chicago, Ill.—Sept 17						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	244	245
Chicago & South Side R. T. RR.....	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	..	9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	82½	83
Met. West Side El., pfd	100	15,000,000	9,000,000	....	82½	83
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
hNorth Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,603,200	....	99	101
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.............com	....	1,250,000	624,900	35 %	12½	18
Union Traction Co. ....pref.	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.—Sept 17:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
lCincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Sept 17:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—Sept 17:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—Sept 17:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway		1,100,000	1,100,000	....	114	115

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref stock of U. R & Elec. Co has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave RR and leased to Nassau system.
h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranteed by West Chicago Street Railway Company, lessee.
Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Sept 17:						
Hartford Street Ry. Co	100	$4,000,000	$200,000	3 % S., Oct.,	150	—
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	—
Holyoke Mass.—Sept 17						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Sept 17.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	—
Indianapolis, Ind—Sept 17.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Sept 17						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	—
Lancaster & Col. Electric Ry	....	....	87,500	....	--	—
West End Street Railway	....	....	....	....	--	—
Louisville, Ky.—Sept 17:						
Louisville Ry.....................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry.....................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Sept 17						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63⅜	63½
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %, Oct.	186	187
Montreal, Canada.—Sept 17						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	261½	293
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.—Sept 7:						
Memphis Street Railway Co	100	500,000	500,000	....	25	—
New Haven, Conn.—Sept 17:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	—
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Sept 17						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
aCrescent City RR............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
bNew Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Sept 17:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
cChristopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	120	185
dMetropolitan Street Ry. Co	100	45,000,000	45,000,000	1½ % Q., Feb., 1900.	151	151½
eBleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
fBroadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
gCen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
hEighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
jNinth Avenue RR.........guar.	100	800,000	800,000	....	195	205
kSixth Avenue RR..........guar	100	2,000,000	2,000,000	....	205	225
lTwenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	110	110¼
m42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Sept 17:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	24½
United Elec. Co. of New Jersey..	100	504,000	504,000	n1¾ % A.	17	18
Pittsburg, Pa.—Sept 17:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
oConsolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,473 850	9,000,000	3 %, Nov.	60	61
pCentral Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
qCitizens' Traction Co	50	8,000,000	‡3,000,000	6 % A.	92¼	92½
rDuquesne Traction Co	50	8,000,000	‡3,000,000	6 % A.	..	...
sPittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	8,000,000	‖2,994,839	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	8,000,000	8,000,000	5 % A., June	..	..
United Traction Co..............com.	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co...............pref.	50	8,000,000	....	J. & J.	51⅜	51¾

*Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for $145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capitalstock.
s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Sept 17						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Sept 17						
Northampton Street Ry	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Sept 17:						
Omaha Street Ry	100	5,000,000	5,000,000	8 % A. and N.	55	65
Paterson, N. J.—Sept 17:						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	..
Providence, R. I.—Sept 17:						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %. Oct. '98.	109	111
Philadelphia.—Sept 17						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount	50	1,966,100	|1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	8 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1, '99.	75	76
Union Traction Co........ $12½ pd	50	30,000 000	29,930,450	....	86⅞	87
eElectric Traction Co	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$3 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	|1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A. Mar. 98	300	...
ePeople's Traction Co	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	|572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	|150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	|740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	|277,402	....	..	...
iPhiladelphia Traction Co	50	30,000,000	|20,000,000	$2 p. sh., Oct. 98.	99¼	99½
jCatherine & Bainbridge St	50	....	|400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry.....guar.	50	1,000,000	|580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	|600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	|475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	|420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry.guar.	50	....	|200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar	50	....	|250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	|835,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co	50	1,500,000	|900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	|750,000	$10 share, July '98	262	263
Rochester, N. Y.—Sept 17						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Sept 17						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
hCity Passenger Ry	50	850,000	850,000	Jan., '98.	133	...
iEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	..
St. Louis Mo.—Sept 17						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	..	..
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry..........com.	50	500,000	500,000	....	20	21
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	..	..
San Francisco, Cal.—Aug.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	..	16
Scranton Pa—Sept 17:						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	..	..
Springfield Ill.—Sept 17:						
Springfield Consolidated Ry	100	750,000	750,000	....	..	..
Springfield O.—Sept 17						
Springfield Street Ry	100	1,000,000	1,000,000	....	..	11
Springfield, Mass.—Sept 17:						
Springfield Street Ry	100	1,200,000	1,166,700	3 % A.	207	212
Toronto Canada.—Sept 17.						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ‡	102	102⅝
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Sept 17:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	...	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	..	..
Worcester, Mass.—Sept 17:						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	80	81½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899	...	85
Wilkesbarre, Pa.—Sept 17.						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. | Outstanding. ‡ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

h Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 17						
American Bell Tel Co	100	50,000,000	23,650,000	4½ % Q., Jan.	142	143
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	98
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	123½	125
New York.—Sept 17.						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	8,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	80	85
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	659,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	79	79½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Sept 17.						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	120
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¼ % Q.	122	125
Providence (R. I.) Teleph. Co	50	.... .	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	...	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Authors'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 17.						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	.	
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	138½	138⅝
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Sept 1						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	..	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co..........com.	..	......	......	....	..	..
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	138½	138⅝
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	..
| Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Sept 17						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	800,000	800,000	Q	..	..
Philadelphia, Pa.—Sept 17						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	65	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	70	80
Northern Elec. Light & Power Co	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co	10	187,500	187,500	....	30	..
Miscellaneous.—Sept 17						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	.....	1% Q ‡	201	202½
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	137⅝	138⅜
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 96.	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

| Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Authors'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Sept 17:						
American Electric Heating Co	50	10,000,000	....	....	..	..
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	..	..
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	..	100
New York.—Sept 17 :						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	..
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Sept 1						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	8¼	8½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	..	162
Welsbach Commercial Co.....com.	100	8,500,000	......	----	21½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Sept 17.						
Carborundum Mfg. Co	100	200,000	200,000	....	..	.
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Sept 17.						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	32	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	55	56
Johns-Pratt Co	100	....	....	----	105	109
*Pratt & Whitney Co..........com.	100	......	....	----	2	4
*Pratt & Whitney Co...........pfd	100	....	......	----	40	50
Stillwell-Bierce Co.............com.	..	....	....	----	..	50
Stillwell-Bierce Co..............pfd.	..	....	....	2 % Sept 1,'99.	70	65
Shultz Belting Co	100	500,000	......	....	80	90
St. Charles Car Co		....	....	......	99	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Sept 17, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*118	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*117	......
‖Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*123	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Sept17 , 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	113⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co.No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....
†Charleston City Ry...........1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry .Co.

Chicago Ill.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T........... .4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	.	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‡W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‡Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Sept 17 , 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Sept 17, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s.	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR... cons mtg. 6s	$150,000	†$150,000	1912	M. & N.	......	....
Crescent City RR...............1st mtg. 6s	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	8,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave.........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	99½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	300,000	300,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	350,000	350,000	1919	......	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorised. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Sept 17, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry.....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J & .	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co...............Col tr. 4s.	29,785,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Sept 17, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Sept 17, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR..........1st mtg. 5s.	250,000	250,000	1918	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J&	17	

*With interest. *Unlisted.

PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—Sept 17, 1900.						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
‡Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117 *
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co....................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*—Sept 17, 1900						
Belt Ry. Co..........................C - mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry........................'‹ mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Sept 17, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅜
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	439,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Sept 17 1900.						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg, Pa. *Date of Quotation*—Sept 17, 1900						
Allegheny County Light Co....... ......6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Sept 17 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...		. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Sept 17, 1900.					100½	101
American Bell Telephone.....................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co.................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Sept 17, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

Western Union directors have formally declared the regular quarterly dividend of 1¼ per cent. on the stock.

There has been listed on the Philadelphia Stock Exchange $1,000,000 additional stock of the Bell Telephone Company.

The North Detroit Electric Railway has executed a $600,000 mortgage on its lines to the City Trust Company of New York.

Directors of the Manhattan Elevated Railway Company have declared the regular quarterly dividend of 1 per cent., payable October 1.

The United Traction & Electric Company of New Jersey has declared a dividend of 1 per cent., payable October 1. Books closed September 10 and reopen October 2.

The Metropolitan Street Railway Company of New York has declared the regular dividend of 1¾ per cent., payable October 15. Books close September 26 and re-open October 16.

The Safety Car Heating and Lighting Company has declared a regular quarterly dividend of 2 per cent., payable October 1. Books closed September 15 and re-open October 2.

The Brooklyn Rapid Transit Company's annual report, although filed with the Railroad Commission at Albany, will it is understood not be ready for distribution for about a week.

The Jackson, Mich., Street Railway was purchased from the receiver recently by a New York broker for $155,000. It is expected that it will be consolidated with the Kalamazoo, Battle Creek & Jackson Electric Street Railway system.

The Columbus, (O.) London & Springfield Electric Railway has increased its capital stock from $100,000 to $1,000,000. The road is being pushed to completion and has about completed its line from Dayton to Urbana.

Directors of the General Electric Company have declared a quarterly dividend of $2 per share on the common stock, payable October 15. This is an increase of ½ per cent. and places the stock on an 8 per cent. basis.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 17@20; New York Electric Vehicle Transportation, 7½@8; New England Transportation, 3½@3¾; Gramophone, 35@40.

The annual report of the Auburn (N. Y.) City Railway Company shows the net earnings of the corporation to be $76,237; operating expenses, $50,002; other income, $342; fixed charges, $22 416; net income, $4 160; total deficit, $21,920,

Specie movements at New York last week were: Silver imports $136,109, exports $964 428; gold imports $30,228, exports $9,800. Since January 1: Silver imports $3 510,216, exports $33 947, 213; gold imports $1,621,464, exports $47,760,536.

P. A. B. Widener says of the Metropolitan Street Railway Company: "We have plenty of money on hand for all the needs of the road, so that the new issue of $7,000,000 stock, which has been authorized, will not be made for a long while yet."

The Rockland County, N. Y., Traction Company has been incorporated with $300,000 capital. The length of the road will be 30 miles, entirely in Rockland County. C. W. Reeves, of Brooklyn, takes 2 958 of the 3,000 shares. Henry F. Shields and Ethelbert D. Harris are two of the directors.

The Gas and Electric Company of Bergen County, N. J., reports for June, July and August: Gross earnings $52,230, expenses and taxes, $32,491; net earnings $19,739. The company reports the number of consumers on September 1 at 5,400, an increase of over 60 per cent. over same date last year.

At a special meeting of the Chicago Board of Trade on the 14th inst., a resolution authorizing the president and secretary to execute contracts with the Exchange Telegraph Company was adopted. One of these contracts provides for the completion of a comprehensive telegraph system, connecting the important exchange centers, on or before December 31, 1904. upon completion of which line the Exchange Telegraph Company is to have the exclusive telegraph space in the Exchange hall and Board of Trade Building in Chicago.

An English copper firm says of the situation: "The outlook is any thing but satisfactory for the average consumer of copper, who has been compelled to pay very much more than he regards as a fair price for the metal, but by the same token the producer it promised a further run of prosperity which he will do his best to prolong in all probability by not being too anxious to increase his output materially. If the smaller miners in America actually did their best during the first half of the current year, it seems a fair inference that not only the mines controlled by the Amalgamated, but some of the large independent properties, deliberately decreased their production. The same remark applies to Europe. The American production for the six months was 134,577 tons, compared with 124,488 tons last year and 120,487 tons in the first half of 1898."

Russell Sage is thus quoted regarding two of the properties in which he is largely interested: "The Western Union is doing a very satisfactory business, and is showing a slight increase as compared with last year, notwithstanding the cutting off of Chicago quotations. Too much seems to have been made of this factor. To contend that it would amount to the wiping out of surplus after dividends and might endanger continuance of dividends at present rates is absurd. Money is being expended freely on maintenance, and the company is better equipped and the property in altogether better physical condition than ever before. The work of electrically equipping the Manhattan lines is proceeding satisfactorily, and on or about October 1 we will be in position to show what we can do in the actual running of trains by electricity on the Second and Ninth Avenue lines. I hope for great results."

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ELECTRICITY.

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

Havana's Street Railway. The various islands acquired by this country as the result of the war with Spain are already feeling to a greatar or less extent American enterprise and push. In the Philippines it must be acknowledged the extent is as yet less than in Porto Rico and Cuba, although many improvements have been made in and about Manila since Admiral Dewey entered that harbor two years ago.

In Porto Rico arrangements are under way for the construction of up-to-date electrically-propelled street railways, as well as electric lighting plants, while Cuba, owing probably to its proximity to this country, has felt the touch of American methods more than any other of the islands. In Havana the antiquated street railway has been taken over by a number of capitalists who some time ago organized the Havana Electric Railway Company. Up to the time of the organization of that company the street railway system, known as the Ferro-Carrill Urbain, consisted of about 25 miles of tracks, located upon 13 miles of streets. Considering the size of the city, this amount of mileage, according to Mr. Hanson, president of the Havana Electric Company, was totally inadequate for the proper accommodation of the public and based on the experience of American cities, could be increased to three or four times the amount with advantage. The Ferro operated 61 cars and 11 steam engines. The number of passengers carried on the street railway lines of Havana before the war, reached 7,500,000 per year, even at the high rate of 15 cents, 10 cents and 5 cents, which were charged on many of them. The Havana Electric Railway Company, which has taken over the property of the Ferro Company, has now in course of construction about 80 miles of track, and they propose to operate on their system about 120 cars. Owing to the narrow streets in certain parts of Havana, and after the company's plans had been submitted to the Governor, it was deemed proper to fix upon two maximum rates of speed on narrow streets. On such streets the speed will be from six to eight miles an hour, while eight to fourteen miles an hour is to be the speed on the wider thoroughfares. On each route cars will be run on a varying schedule, to suit the requirements of travel, starting with ten minutes' headway, reducing the headway to 7½ minutes, and then to 5 minutes, so that during six hours daily the headway on each of the four lines will be 2½ minutes, Night car service will be established from midnight until regular day car service.

The new track construction consists of 7-inch girder rails, weighing 90 lbs. per yard. The Havana authorities have insisted that the double overhead trolley system be installed, which will prevent the possibility of damage by electrolysis to any underground metal structures that may be laid before or after the completion of the road. It is expected that the line will be ready for operation by the middle of December when the residents of Havana will have at their disposal as adequate means for transportation as are to be found in most small cities of the United States.

* * *

An English View of Nikola Tesla's Invention. The patent granted Mr. Nikola Tesla on August 14 for a method of insulating electrical conductors, and which was referred to in the issue of Electricity of August 22, seems to be attracting considerable attention in England. The process, as will be recalled, consists in a word in placing the conductors in a trough below the surface of the ground and surrounding them by a frozen substance which is supposed to act as a perfect insulator. Owing to the present high price of coal in certain parts of Great Britain several English papers seem to think that if Tesla's scheme is practicable a large amount of money could be saved by generating electric current at points where fuel could be obtained cheaply and transmitting it to localities in the Kingdom where high prices for fuel prevails. Referring to this subject editorially the N. Y. "Sun" recently said:

"Welsh coal now costs at Cardiff, its port of shipment, about $7, while North of England coal cannot be laid down at its shipping point, Newcastle, for much, if any, less than $6. Such prices obviously threaten to deprive England of her export trade in coal, which, last year, was valued at upward of $43,000,000, exclusive of the quantity sold to ocean-going steamers for steam-generating uses on their outward voyages. This is by no means the most ominous outcome of the situation, however. As the London 'Spectator' points out, the recent rise in the price of English coal portends lower

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wages to all British workingmen but colliers, and more men thrown out of work. As the cost of each industry becomes greater, owing to the large sum required for the purchase of the power-creating combustible, the smaller factories will be closed one by one, and the larger factories will reduce their output. So far as producers are concerned, what dear coal means is ruin to small employers, diminished profit to large employers, and less work with less pay for the men employed. To consumers, on the other hand, it means higher prices for all manufactured products, although to the poor even a slight increase in the price of necessary articles is a hardship.

"An increase in the cost of clothing, for instance, can be met on the part of the workingman only by buying inferior articles or by pinching in his food. Still another privation is unavoidable, if the present prices of coal in England continue; as they must, unless English railways lower the charges for transportation, which nobody expects to see them do. Throughout Great Britain, during the winter, fires are a necessity of health, and, in a large part of the island, a necessary of life. It is certain, however, that, when the price of coal passes a certain figure, even the preservation of life will have to be disregarded by the poor. Warmth is a luxury for which people of limited means cannot pay more than a certain price.

"If, then, Mr. Tesla's scheme be practicable, two indispensable things may be secured by the mass of England's population, namely, cheapness of manufactured products and cheapness of warmth."

The "Spectator" further holds that an incalculable improvement would be effected in the conditions of British life if Mr. Tesla's method of transmitting electricity should prove practicable, and should be adopted on a large scale in great Britain. Electric lighting would be so cheapened that householders would no more be poisoned by gas, or run the risk of fire from kerosene lamps. Electric heating would be introduced, and place Englishmen as regards the air in their houses on a level with the inhabitants of Southern Europe. In a word, light and warmth would be supplied with as much ease as water, and possibly at a smaller cost.

There is no doubt but what Mr. Tesla's invention would materially tend to benefit mankind if it proves practicable. But in the case of new inventions and untried things the "if" should not be overlooked, and as we stated last month there would seem to be several reasons why this method of insulating electrical conductors will scarcely prove a commercial success. It might be well therefore for our English cousins to await further developments before becoming too enthusiastic on the subject.

* * *

Trade and Its Possibilities in Scotland.

The recent tendencies of trade in certain sections of Scotland, especially in Edinburgh, indicates that American manufacturers and exporters are giving due attention to a market which was practically long neglected. Although American goods of various kinds have been sold in Scotland to a limited extent for many years, yet it can hardly be said that there was any serious effort to build up a trade in any particular line until the manufacturers set themselves to the work of placing their wares directly before the people by sending representatives there, either from the United States or from the London agencies.

So long as our manufacturers seemed to be content to allow a general agent in either London or Liverpool simply to take orders from Scotland just whenever they happened to receive any, the growth of the trade was, as a matter of sequence, exceedingly slow. When, however, modern methods of trade extension were adopted, and agents from the United States as well as salesmen from London and Liverpool, were sent among the Scottish business men to show wares and give prices, there was a quick change for the better in the volumn of trade.

In the first instance manufacturers in this country took a wrong view of Scotland and its possibilities. They seemed to be under the impression that this division of the United Kingdom was a mere commercial appendage of England; whereas, as a matter of fact, the laws, methods, business habits and customs in Scotland differ very materially from those maintaining in England, and to obtain trade there a foreign manufacturer must present himself to Scottish business men, and meet their requirements, quite irrespective of any connection, however successful, that he may have with Great Britain in other parts.

The Scotchman thinks for himself, and selects goods upon what he regards as their merits. No one is more alert than he to discover the real value in goods of any kind, and it follows that the best way to sell goods of real value in Scotland is to bring them directly under the notice of the best business houses, and to give to those houses the benefit of the lowest price. American manufacturers are adopting this plan, and they find that it pays. This is pretty clearly shown by the increasing proportion of American exports to Scotland through the Scottish ports, thus saving, in large part, the expense of inland transportation. This proportion will, it is probable, grow steadily in the future, inasmuch as the facilities for all-water transportation between North Britain and the United States are improving.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The "Electrical World and Engineer," in its issue of September 22, makes the amende honorable as follows:

"In our last issue attention was prominently called to the electric lighting situation in San Juan, Porto Rico, where an attack of suspicious and even vicious character has been made on an enterprising American company putting in a new street lighting and trolley system there. To support the attack alleged interviews with two editors of two New York electrical journals were published in San Juan, roundly damning the alternating current and aerial circuits. We referred to the dubious nature of these interviews and ventured to hope that we might elicit a denial that would counteract the intended injury to the new company in San Juan. Mr. W. L. Hedenberg, editor of Electricity, whom the local Porto Rican newspaper had named, now comes forward in his latest issue and, as we anticipated, contradicts the interview alleged to have been had with himself as follows: 'I beg to say right here that the statements credited to me are false from beginning to end.' This emphatic refutation should give a quietus to the clumsy conspiracy in our West Indian annex against American enterprise and modern electrical apparatus."

As was to have been expected and in accord with its usual policy of allowing its first statement to stand, even when wrong, the "Electrical Review" shuns the subject entirely. Really, some papers have no more backbone than a jellyfish.

The Rensselaer Polytechnic Institute of Troy, N. Y., will have in operation by October 1, a new electrical laboratory, containing sixteen machines, generators and transformers, together with a full equipment for practical tests. These have all been presented to the Institute during the past year and will afford excellent opportunities for students in electrical engineering.

A new smoke consumer was recently tested at the plant of the Commercial Electric Company of Indianapolis, Ind. The test was made under the direction of the building inspector, who still says he hopes to be able to stop the smoke nuisance.

It is announced that G. W. Miles will erect an electric plant to cost $40,000 at East Radford, Va., to furnish power to run machinery, and will offer as a special inducement to enterprises to locate there electric power gratis for two years at any capacity.

The Federal District Street Railway Company which operates the street railway lines of the City of Mexico and Puebla, contemplates connecting the two cities with an electric road. There are a number of thriving towns in that vicinity, which will also be connected with the City of Mexico by electric lines.

Howard K. Wood, of the Corporation Trust Company of New York, who recently returned from a several months' trip in Europe, said that he was surprised at the remarkable increase in the amount of American goods that can be seen everywhere in the principal cities. "The increase has become marked within two years," he said. "All the elevators one can see in London and Paris are of American make, and n the new rapid transit line, which is now in operation in London, most of the electric appliances bear American names."

Electricity as a motor for regular railway trains has been found 15 per cent. cheaper than steam in the experiments recently made at Berlin on the Wansee-Bahn.

E. B. Pope, Western passenger agent of the Chesapeake & Ohio Railway at St. Louis, Mo., has lately invented an ingenious device, which consists of a second electric "headlight," or searchlight, mounted upon the roof of a cab of a locomotive, pointing always to the rear of the train, therefore he calls it a "hind light," and the chief object of the invention is to protect the hind end of the train from being run into by any train that may be following it. The "hindlight" rests upon the roof of the cab, and is attached to one end of a lever about eight feet long, and is steadied and controlled by two parallel rods, and by means of a simple arrangement of cylinders and compressed air can be elevated six or seven feet above the roof of the cab or swung around at right angles to either side of the cab, so that the powerful light can

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be seen at a great distance from any point in the rear of or on either side of the train. Intense darkness, rain, snow or fog simply render the light more prominent, and the engineer can instantly change the color of the light from white to red or green, as occasion may require.

IT is said that the electrical effects to be exhibited at the Pan-American Exposition in Buffalo, N. Y., next year, will exceed anything of their kind ever shown before. The enormous energy of the Niagara power plant will be available for the contemplated illuminations and this will mean that a flood of electrical energy will be poured in to maintain the really marvelous display of electric light that will be shown. It has been suggested that an artificial sun shall be shown, consisting of an immense plate of carbon heated to blazing incandescents by means of five or ten thousand horse power of electrical current. Such an apparatus would develop many million candle power and would really rival the sun in its illuminating effect in the immediate neighborhood.

OMAHA capitalists propose to tunnel the great continental divide, 80 miles west of Denver, and 12 miles south of Georgetown, and operate an electric road through it. It will start at the base about 14 miles from Grant and terminate at the head waters of the Snake River, will be 7,000 feet long and 1,700 feet deep. The object is to facilitate mining operations. The tunnel will be built of sufficient size to admit a steam railroad train, and may be utilized by some one of the great transcontinental lines as a short cut.

ISRAEL A. KELSEY, until recently general manager of the Winchester Avenue Railroad Company, and who controlled large blocks of stock in several trolley companies in Massachusetts and Rhode Island, died at his home in West Haven, Conn., Monday, aged 41. Mr. Kelsey was attacked with nervous prostration while aboard his yacht in the early summer and since then had been confined to his home with malarial fever, which finally merged into typhoid fever.

ACCORDING to reports, the introduction of electric traction and lighting into South Russia is making rapid headway. A Belgian has obtained a concession to construct and work an electric tramway in the town of Poltawa. The necessary capital will be found by a limited company to be promoted in Brussels. It is intended to commence the construction of the line next spring. Further, the Belgian Street Railway Company in Odessa has obtained a concession to construct and work an electric railway in Winnitza, and to light the town by means of electricity for a period of 30 years. Not long since a cable works was opened in Kiew. At present it is producing only insulated wires for telegraph and telephone work, but later on it is intended to install a plant for the manufacture of electric light cables.

UP to the present there have been two general methods for operating railroad switches from a central tower. The most common and oldest of these is by means of manual levers in the tower, mechanically connected to the track switch by a system of rods, chains or wires. The second system known as the electro-pneumatic, consists of electro-magnets, controlled from the central tower operating valves which in their turn control the compressed air used to change the switches and signals. Now there comes a new system, the "all-electric" as it has been named, which consists simply of a small electric motor at each switch, whose action is governed from a central tower. The only connection necessary is the two wires of the motor circuit. This system has recently been installed in several railroad yards in Chicago, and is giving satisfaction. The practical perfection of the whole apparatus, which in theory is so simple, and especially of the electric interlocking machine in the tower, is the result of several years' experimental work.

THE Green Signal Corps of Dallas, Tex., is now drilling with the heliograph. "The heliograph," said Lieut. Camp, "will transmit messages from one eminence to another accurately 85 miles, and it is claimed that it has done so 100 miles. We are drilling at night with the instruments under the electric lights, which answer every purpose for short distances. Merely for drill purposes, as we can learn as readily by this means as with the sun. During the fair we propose to put a searchlight in the cupola or tower of the courthouse, and another in the tower of the exposition building on the fair grounds and give exhibitions of our skill as a signal corps in transmitting messages by night or by day for long distances where telegraph or telephone systems can not be used, as in the case of war, for instance."

GREAT expectations are entertained and many plans are being formed in Porto Rico for the installation of short inland electric railways from the central range to the coast. The power is to be developed through the agency of many streams to be met with in every part of the mountain range, which traverses the island from end to end. If all that is expected in the way of new roads and other electrical works is accomplished there will be a field in Porto Rico for considerable electrical machinery and material. The only road on the island, from the capital to Rio Padres, some nine miles in length, is shortly to be equipped electrically.

A. J. CASSATT, of the Pennsylvania Railroad, who reached home from Europe last week, said that while in London he looked into the underground railroad system. "It is one that will be adopted in this country," he said. "They have gone down eighty feet in London, the purpose being to get below all pipes and foundations. At that distance below the surface they run trains that carry an average of three hundred each. The motive power is electricity, and in equipment they have closely followed the elevated road in New York. The tunnel is dry and there is good ventilation. The constant movement of trains forces the air out of the shafts and out of the elevators used to lower the passengers, and there consequently is no vitiation. While there will, of course, be surface transit still I am of the opinion that the underground system will be taken up in our large cities."

THE signal officer at Washington, D. C., has received a report from Lieut. D. G. Burnell, who is constructing the telephone line from Fort Valdez to Fort Egbert. He hopes to have the line constructed and in use this winter. Fort Valdez is on the open sea, about 100 miles north of Juneau, and near the mouth of the Copper River, while Fort Egbert is the post on the Yukon near the eastern boundary line. Lieut. Burnell says that anything in the way of reading matter that could be sent through the Quartermaster's Department for the enlisted men in Alaska would be most acceptable to the soldiers during the long winter that is before them.

THF BRITISH ASSOCIATION.

[From our London Correspondent.]

The 1900 meeting of the British Association for the Advancement of Science, which closed on Wednesday, September 12, at Bradford, has been an excellent one from an electrical point of view. Abstracts of some of the papers are now being reprinted in ELECTRICITY. One that was delivered from a few rough notes in his note book by Prof. S. P. Thompson was of great interest to the small company of practical electrical engineers, who happened to be assembled when it was delivered. It was devoted to a comparative consideration of the numerous types of dynamo construction and design in evidence at the Paris Exhibition, with special reference to several particular machines. It was a pity that so important a subject should be dealt with to so scant a company; but the professor is an eminent expert in dynamo design, and his complete paper will be welcomed by all interested in the subject, when it is published. On Saturday evening, the professor lectured himself into the affections of over 3,000 of the artisans and general populace of Bradford on electricity in the industries, and by means of many elementary experiments carried out in his own inimitable and pleasing way, the professor made his lecture more instructive than is sometimes the case with some lectures. He did not lose the opportunity for rubbing it into Brad ord people of what great advantage electric driving could be to them in the textile industries for which their factories were world-famous. He quoted instances of Swiss factories which had found their salvation by substituting for old methods the adoption of electric power. He dwelt in a most enthusiastic and convincing manner upon the necessity for such towns as Bradford supporting the large electric power distribution schemes. The next fifty years are rich in promises for the applications of electricity. The supply of electric power at cheap rates, he said, was a national and social question rather than merely municipal. He also did not forget to tell his hearers that he was the inventor of a surface contact system of electric tramway, at the same time advising them to dispense with the overhead wires! *Verb sap.*

An evening discourse to nearly 2,000 members of the Association, was delivered by Prof. Gotch, F.R.S., on "Animal Electricity." He held his hearers with unflagging interest from first to last, and explained in great detail the electric cell structure of electric fishes. Lantern slides and diagrams were thrown upon the screen showing these, illustrating the electric action and so on of skate, gymnotus, malapterurus, etc.

The titles of certain other papers have already been stated in ELECTRICITY. It only remains to be added that the meeting was a success, and that next year's conference will be held at Glasgow, opening on September 11. Prof. A. W. Rucker, F.R.S., will be the President.

It has been decided to allow women members to act on the committee. An argument used by Prof. S. P. Thompson in favor of this, was that one the best papers read at the Paris International Electrical Congress was that by Mrs. Ayrton.

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ELECTROLYTIC ANALYSIS.

(Summary by our London Correspondent.)

The sixth report of the British Association Committee, which has been investigating the electrolytic methods of quantitative analysis since its appointment in 1894, completes its work. Hitherto the work of the committee has included a complete bibliography on electrolytic analysis up to the end of 1894, and experimental investigations on the electrolytic determination of antimony, bismuth, cobalt, nickel, zinc and the separation of antimony and zinc. This year's report deals with further work on the determination of bismuth, and with the determination of iron, its separation from manganese, and the application of the electrolytic method to the determination of iron in organic products. These experiments cover some of the most important applications of electrolytic analysis which required further investigations. The following are embodied as part of the report:

"The determination of bismuth (Part II)," by Prof. J. E. Reynolds and W. C. Ramsden.

"The determination of iron," by Charles A. Kohn.

(1). "The conditions under which iron is deposited from ammonium oxalate solution, and the most favorable conditions for its electrolytic determination," by C. A. Kohn and H. H. Froysell.

(2). "The influence of ammonium chloride on the electrolytic determination of iron."

(3). "The complete separation of the iron when deposited from ammonium oxalate solution; the sulphocyanide reaction for iron under the conditions of the experiments," by C. A. Kohn, F. J. Brislee and H. H. Froysell.

(4). "The presence of carbon in iron deposited from ammonium oxalate solution, and the determination of its amount," by C. A. Kohn and F. J. Brislee.

(5). "The electrolytic separation of iron and manganese in ammonium oxalate solution," by Kohn and Froysell.

(6). "The electrolytic determination of iron in urine and other animal products," by Kohn and G. C. Clayton.

Note on the Propagation of Electric Waves Along Parallel Wires.*

BY W. B. MORTON.

In the "Annalen de Physik" for June, 1900, a very complete investigation of this problem has been published by G. Mie. He finds expressions for the wave-length and damping of the oscillations, involving a series of ascending powers of the ratio of radius of wires to distance apart. The object of this note is to point out that the approximate solution, in which the square of this ratio is neglected, can be very easily obtained from the known solution for a single wire, as worked out by Prof. J. J. Thomson, and by Sommerfeld. The formula for the damping agrees with that given by Heaviside's simple theory when Lord Rayleigh's high frequency values are used for the resistance and inductance. Attention is called to an error in the formula for the Ko function in the work of Thomson, Sommerfeld and Mie, arising probably from an erratum in Heine's "Kugelfunctionen." It affects the numerical values worked out in Sommerfeld and Mie's papers.

* Abstract of paper read before the British Association for the Advancement of Science, held at Bradford, Eng., Sept. 8, 1900.

DUST FIGURES OF ELECTROSTATIC LINES OF FORCE.*

BY DAVID ROBERTSON, B.SC., A.G.T.C., A.I.E.E.

The method of getting pictures of magnetic lines of force by means of iron filings is so well known that it is surprising that the making of analogous pictures of electrostatic lines does not also form one of the regular lecture table experiments of every elementary class on electricity. More especially is this the case now that electrostatic phenomena, which at one time were considered of purely scientific interest, are every day becoming of more importance in the application of electricity to practical purposes.

Some time ago the writer described† a method of obtaining such pictures with the apparatus illustrated in Fig. 1. Tinfoil electrodes of any desired form and number are stuck on one side of a sheet of glass, and this is laid in the wooden frame, W F, with the tinfoil on the under side. A half-plate photographic glass is a convenient size to use, and then a plate carrier from a camera or an ordinary printing frame will serve to hold it, but larger plates may be used with advantage. Vertical connecting wires, with spring tops, make contact with the tinfoil electrodes, and put them into connection with the poles of an electrical machine through the bare connectors, C, and fine spirals of covered wire. These connectors are insulated from the table by a sheet of glass or ebonite. Each electrode will have a separate vertical wire, and the connections for any desired combination are easily made at the bottom by short pieces of bare wire. Another bare rod, S C W, lies across the two horizontal wires, so as to short-circuit the machine.

By means of a sieve or pepper pot fine sawdust is sprinkled as uniformly as possible over the top of the glass, and then the machine may be set in motion by an assistant. The operator should now start tapping the rod carrying the frame, etc., and then lift the short-circuiting wire by the silk thread, S T. Whenever the machine excites, the dust will be seen to gather into lines, and the action should be stopped by dropping the short circuiting rod as soon as the desired effect is obtained. The whole secret of getting good results lies in stopping it at the right moment. The tapping must, of course, be discontinued before S C R is dropped, or the dust will get shaken out of position again.

By observing the following rules good results may be obtained with a little practice. The glass plate must be level, as otherwise the vibration produced by tapping, which is necessary to diminish friction, causes the dust to shift downwards. It should not be clamped in any way, but ought to lie loosely in the wooden frame, so as not to give vibration figures superimposed on the electric ones. The sawdust should be fine, but not powdery. That obtained from mahogany with a tenon saw or a coarse rasp does very well, and it is a good plan to blacken it with ink so as to make it more visible. Many other materials, such as tea leaves and oatmeal, will also do. When glass is used for insulating from the table, white paper should be placed below it. The dust is then easily seen against the white ground, which should be well lighted. This is the best way of looking at these curves. The glass plate should be carefully discharged in a current of hot air between each experiment.

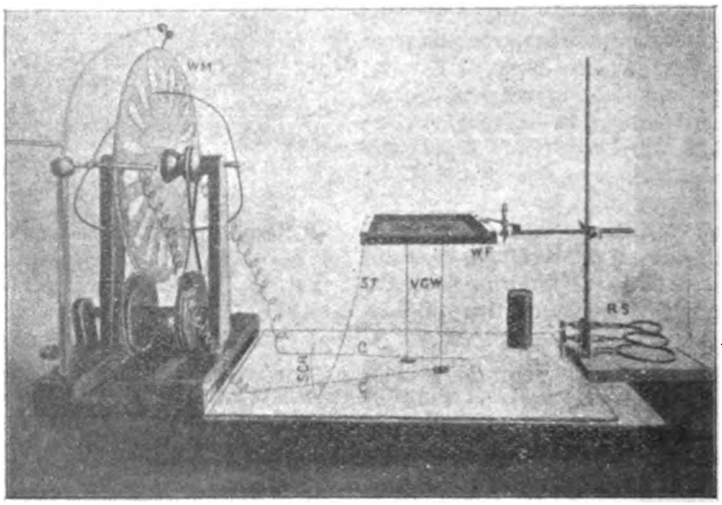

FIG. 1.—APPARATUS FOR MAKING ROBERTSON'S FIGURES ON ELECTROSTATIC FORCE.

The behavior of the dust depends very much on the material of which it is made, on its fineness, and on the state of the atmosphere. With coarse sawdust the lines often draw together, and become more strongly marked when the action is prolonged, the ends at the same time gradually receding from the foil. At other times, more especially with fine light dust, almost as soon as the lines are formed it flies off the plate, beginning at the parts immediately over the tinfoil. It is this which necessitates the rapid discharge given by the short-circuiting rod. Most of the illustrations show the effect of the commencement of this jumping off in reducing the amount of stuff in the neighborhood of the electrodes.

Several curves obtained in this way are reproduced in Figs. 2 to 7. For Fig. 2 only one electrode in the form of a circular disk was employed. We may regard this as showing the lines of force round the edges of a charged circular disk, or as the projection of those from a charged sphere. Similarly we may look upon Figs. 3 and 4 as illustrating the fields of two spheres when electrified with opposite, and similar charges respectively. In like manner Figs. 5, 6 and 7, which show the fields surrounding charged strips, may be taken to represent the fields of flat plates, of which the strips are cross-sections.

In comparing these with magnetic curves, it should be remembered that in every case the tinfoil electrodes correspond with the *ends* of

* From the "Electricial Review." London.
† See Proc. Roy. Soc., Edin., 1898-99, page 361.

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magnets whose cross-sections are of the same shape as the tinfoil. Thus, the long strips do not correspond to magnets placed lengthwise, because the whole of one strip has a charge of the same sign, while the two ends of a magnet have opposite polarity.

When it is desired to fix the curves for future use, the upper side of the glass should be coated

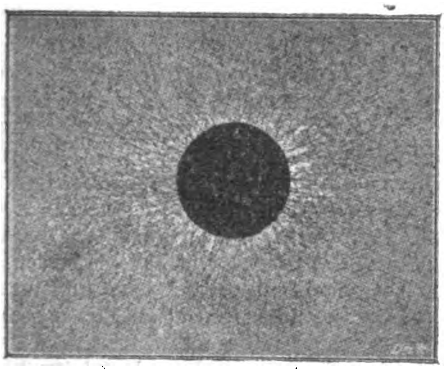

Fig. 2.—Field of a Single Disk.

beforehand with paraffin wax or a mixture of wax and vaseline. This can be done by heating the plate before a fire, and then rubbing it with a piece of the wax. When sufficient has been thus melted on to the glass, and spread as smoothly over it as possible, it is placed horizontally and allowed to cool. After the wax has

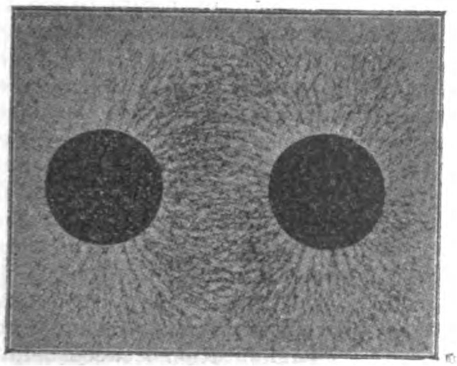

Fig. 3.—Field of Two Oppositely Charged Disks.

set, curves may be made in the same way as before, and then fixed by holding the plate before the fire again until the wax melts, keeping it level until it has again set. A cover glass should then be placed on this side, and the whole bound up like a lantern slide.

The waxed surface offers more friction than the plain glass, but in spite of this, nice curves can be obtained and fixed in this way.

The behavior of the dust may be explained

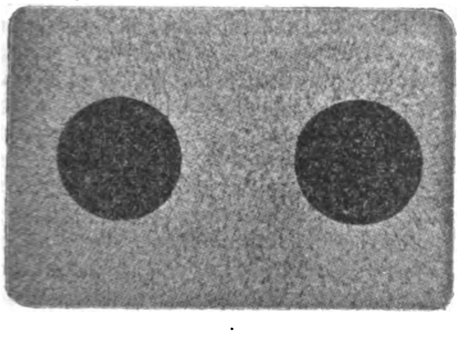

Fig. 4.—Field of Two Similarly Charged Disks.

thus. Suppose we have a number of conducting particles lying on an insulating surface, and near to these an electrode charged with positive electricity. Each particle will have a negative charge induced in its near parts, and an equal positive charge on its further ones; and since the field tends to separate these as far as possible, each particle will tend to set with its longest axis in the direction of the field at that place. We may therefore draw them in that position. It will then be seen that when two particles are exactly abreast, as A (Fig. 8), they will repel one another; but if one is a little ahead of the other, as at B, they will attract one another, and so tend to draw into line, with the result that curves are formed which show approximately the direction of the force at each point. Evidently it is preferable to have long-shaped particles, so as to let the opposite charges get farther apart, and to allow each particle itself to indicate the trend of the field. Since the attracted negative is closer to the electrode than the repelled positive, the attraction will be greater than the repulsion, and there will be a slight tendency for the particles to move towards the electrode under the conditions of the diagram. So far this explanation is on the whole the

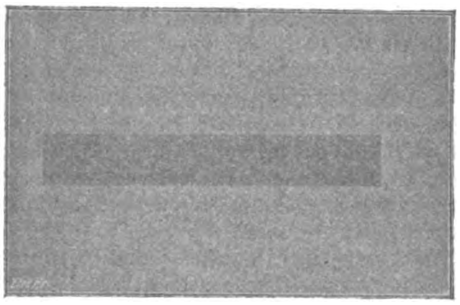

Fig. 5.—Field of a Single Strip.

same as for magnetic curves, with the substitution of + and — charges for N. and S. poles. With magnetic curves the drawing in of the filings towards the poles is very well marked.

There is, however, an important difference. The poles of a magnet cannot leave the metal, and every filing must have equal N. and S. poles, but it is possible for the electric charges

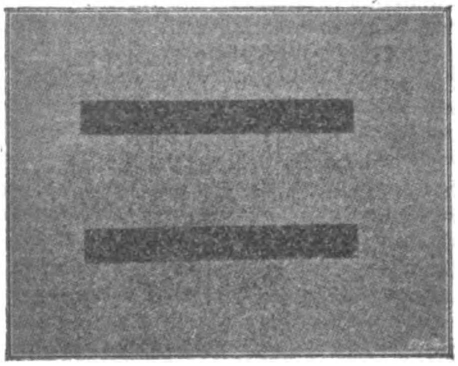

Fig. 6.—Field of Two Oppositely Charged Strips.

to leave the particles, and to have a particle with only one charge on it. Now, in our experiments, the tinfoil is slightly below the level of the dust owing to the thickness of the glass. The attracted charge on each particle will, therefore, keep towards the under side of its near end, while the repelled charge will take the upper side of its further end. Consequently, the attracted charge is more liable to be deposited on the glass. There would then only be repulsion, and no attraction, and so the particle would be driven away. This explains how the dust flies off, and why it does so most energetically above the tinfoil and its immediate neighborhood, where the force has a large vertical component. This vertical component might, of course, be eliminated, except on the top of the tinfoil itself, by placing the tinfoil side upwards, so that the dust and tinfoil come on the same side, but other difficulties then arise with the connectors, and from the fact that the dust is in actual contact with the electrodes.

There is also the possibility of charges passing from one particle to the next, and for both

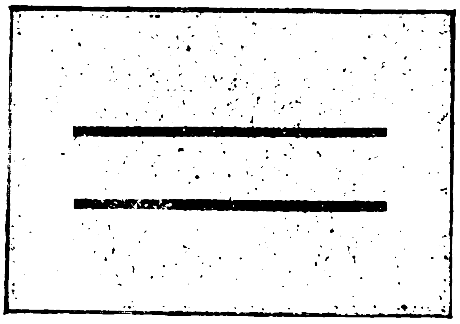

Fig. 7.—Field of Two Similarly Charged Strips.

these reasons we do not wish the material to be too good a conductor, at least, on the surface, and yet it must be a conductor to allow the induction to take place. In fact, a conducting kernel within an insulating shell would be an ideal type of particle to employ.

Again, when the electrodes are strongly charged, the electricity creeps over the surface of the glass, and so increases indefinitely the extent of surface actually acting as electrode. This is why we do not get results if they are charged beforehand.

The forces concerned are thus much smaller

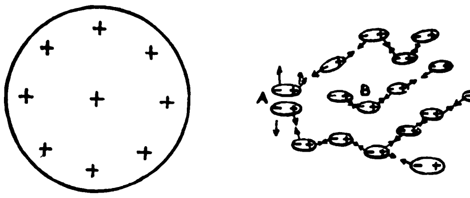

Fig. 8.—Inductive Action on the Particles.

than with magnets. Hence much more care is required, and the curves are not so strongly marked as the corresponding magnetic ones. Cases with two oppositely charged electrodes, such as Figs. 3 or 6, give the largest forces, and are therefore the easiest to obtain, while those with two like charges do not as a rule come out so sharp.

Transition of Electric Power.

A. D. Adams in "Cassier's Magazine" for October will say that with electrical distribution of water power only a small space is necessary for the few large wheels and dynamos that absorb the entire energy of the water. Mill sites, instead of being confined to a little land along the banks of a river or canal, at once expand to include the territory within five, ten or a greater number of miles of the generating plant. This expansion of surface area affects the number and character of power users. The number of industries is limited only by the water available, and the capacity of each may be either great or small. Since mill sites have come to include all the land within a long radius that is not required for other purposes, the opportunity to buy cheap power has only a slight influence on

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rents. Almost the entire saving in the cost of power is thus free to be divided between the water company and its patrons.

A distinct feature of electrically distributed water power is the advantages it offers to manufacturers of small and medium capacity. The consumer of 100 horse-power will probably have to pay somewhat more per unit than the consumer of 1,000 horse-power, but the difference in rates will represent only a small fraction of that in cost which would result were a separate water wheel installed for each case.

RELATIVE ADVANTAGES OF ELECTRIC AND SHAFTING DRIVING FOR SHOP USE.*

A comparison of the relative advantage of electric and shafting driving for shop use may be made under the following general headings:

1. Relative economy in cost of power itself.
2. Relative convenience of operation and installation.
3. Relative effect upon shop output and cost of labor.

Referring in detail to the scope of these considerations:

1. Economy.—This has been taken to comprehend only the relative cost of operating the two systems, including expense for fuel, attendance, repairs, interest on investment and depreciation. It is the reason most generally advanced for the installation of electric power, but can only be the controlling one where the cost of power is a large proportion of the shop running expenses.

In order to compare the relative efficiencies of engine and electric transmission, it will be necessary to subdivide the character of shop plants somewhat. To do this completely would lead to endless complication, but for present purposes the typical plants are:

1. Shop plant in which each building has its own power plant.
2. Shop plant in which all buildings are furnished with power from a central source.

The matter of connection from the prime mover to the tools may be assumed, for an extreme comparison, in either of two ways, namely: (a) shafting method; (b) individual tool driving method.

Taking the first condition the average efficiency from engine to tools for steam engine transmission is shown to be 50 per cent.; for electric transmission, under condition "a," the shafting losses will be reduced by splitting up long lines and by avoiding cross-belting, so that they will not exceed 20 per cent., or an efficiency of 80 per cent., and in the electrical elements, as before shown, the efficiency from engine to shafting is 65 per cent.; therefore, the final transmission efficiency will be $80 \times 65 = 52$ per cent., as against 50 per cent. in the purely mechanical method; or, practically, a stand-off. Under condition "b," much less shafting will be employed, and the electrical portion may also show a better all-day efficiency, under certain conditions, by the shutting down of idle machines—say, a shafting efficiency of 90 per cent. and an electrical efficiency of 66 per cent., or a resultant of 60 per cent.—showing a gain for the electrical method.

* From a report by a committee to the Master Mechanics' Convention, held at Saratoga, N. Y., July, 1900.

Taking the second condition and assuming an unfavorable condition for shafting transmission, as in case of a shop having each building with its own boiler plant and one or more engines, and compare this with a case of a central power plant for electrical transmission to all buildings, the possible fuel saving in the latter arrangement will result first, from some small saving in power required for each individual building, as before shown, and second, from some very considerable saving due to the better efficiency of a large engine and boiler plant over that of several small ones. In extreme cases, where large condensing engines displace small non-condensing ones, and in large stations having a uniform load, the fuel saving may readily approximate 33⅓ per cent.

The item of attendance will next be considered. It is made up of three classes of labor—engineers and firemen; care of shafting and belting; electrical repairs. In an electric system the cost can be reduced by consolidating the engine and boiler plants and by the elimination of large and heavy belts, large shaft bearings and the consequent danger from overheating, reducing labor probably one-half; but a new item of expense in care of electric machinery will be introduced, which will about offset the other items, leaving the whole attendance bill practically unaffected by the introduction of electric shop power in plants of any considerable size.

As to repairs of shafting and belting, it is difficult to obtain accurate data, the record of these items being seldom kept separately in shop accounts. The records of one large establishment have, however, been examined by your committee and the saving found in these items, under the electric driving system, is found to be more than sufficient to pay for all repairs to motors and lines. Thus the conclusion seems justified that the repair item will not be materially different under either system of driving.

The remaining items of power cost are depreciation and interest on investment. It is difficult to institute a fair basis of comparison between the first cost of an electric and a steam transmission plant, for the reason that the results sought to be accomplished by the former provide additional shop facilities, and are therefore not rightly chargeable in a substitution sense. Considering, however, the case of simple substitution in a single shop, where the power plant and arrangement and number of tools is retained as before, electric driving is certain to involve a largely increased first outlay—approximately double that for shafting method. But in a modern shop plant other considerations are the guiding ones in a selection of the power system, such as the possibility of labor-saving devices, cranes, etc., and the greater cost of the electric system becomes a rightful charge against the advantages so obtained.

Dropping, therefore, any attempt to draw a strict comparison between first costs, it may be said that in estimating the total cost of power machinery it is usual to include an allowance for interest and for a sinking fund, with which to replace the plant when its utility is no longer on an equality with best practice. These items are generally figured together at 10 per cent. on first cost, a sum amounting roughly to one-fourth of the total running expenses of the power system.

CONVENIENCE AND SHOP OUTFIT.

These considerations are so closely interdependent that they can best be referred to together.

The ordinary shop plant with steam power transmission, both in the arrangement of building and of machines, is the slave to the limitations of this system; it must be laid out so that the shafting and engine connection is as direct and simple as possible; the machines must be compactly arranged in parallel lines, and the ceilings and columns designed with special reference to shafting supports. In other words, the tools must be installed with first reference to the application of power, and not, as should be the case, with reference to handling the work to best advantage. Handling operations are of necessity largely by manual methods, and the shop buildings, even, must be located with first view to getting the power to them with the least awkwardness and expense.

While generalizing in this manner, your committee has not lost sight of the fact that handling and transferring machinery may be operated by other means than electricity, but it is equally true that devices of this nature are of limited practical application, and the broad fact remains that electricity is to be credited with ushering in a new era of labor-saving shop devices.

Electrical transmission places no restriction on the location of the machines, and each shop may be planned with a view to handling its product with least waste of labor and with the greatest convenience of access to the tools. These may even be transported from place to place to the work; further, the partial or entire absence of overhead line shafting insures better lighting of the shop and conduces to cleanliness. These factors promote cheerfulness and an improvement in both quantity and quality of output.

The clear head room permits the universal application of various forms of traveling cranes for serving the tools and for conveying operations, furnishing the most efficient means yet developed for increasing shop economy, and as a means of communication between buildings, electric cranes and transfer tables have advantages over appliances of the same nature driven by steam and air.

SPECIAL APPLIANCES.

In these, electricity shares a large field with compressed air. It must be admitted that air devices have up to the present time received most attention at the hands of the railway mechanic: a fact in large part due to the lack of practical knowledge of the electrical specialist and to the greater cheapness of air tools. With, however, the general introduction of electric shop power plants and the better acquaintance of practical men with the agency, an extensive application of electric labor-saving devices is certain to result.

Flexibility.—The extension of a shop building or the tool equipment under the shafting system is generally a matter of much difficulty, and the attempt to add to such a plant often results in inconvenient crowding of the tools or to an overloading or complication of the shafting system, a fact which fully accounts for the extremely poor efficiency sometimes quoted for shafting transmission. In an electric system, on the other hand, great flexibility in extension is secured, as new buildings may be placed in any convenient position and additions made to the driving system without affecting the intermediate links.

Speed Control.—The ease of speed control between wide limits of certain types of electric

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motors is a valuable feature and will result in more frequently securing a greater adaptability of the tool to the work than is possible where a change in speed involves stopping the tool and shifting belts and gearing.

Increase in Output.—This constitutes, in the opinion of your committee, the chief claim of electric transmission to the attention of shop managers, and follows from the previously mentioned facts, as, by the use of electric handling devices, the tool is quickly served with its work and the product placed in the most favorable position for operating upon and idle time cut down, and, by independent driving, the capacity is increased by reason of the perfect control of speed possible.

POWER GENERATION.*

Comparative Cost by the Steam Engine, Water Turbine and Gas Engine.

BY JOHN B. C. KERSHAW, F. I. C.

There is no question of greater importance at the present moment to those engaged in the management of our manufacturing industries than that of power generation. The supremacy which the steam engine has long enjoyed is now assailed from two sides. The water turbine and the gas engine have become dangerous rivals.

During the past ten years a most remarkable development of hydraulic power has been taking place on the Continent of Europe in France and Germany, and in America at Niagara.

The aggregate amount of power at the present date generated from falling water forms no inconsiderable portion of the total power utilized in manufacturing industries; and two years ago it was estimated by the author to be between 236,000 and 350,000 horse-power.

On the other hand gas engineers have been busily engaged in working out the problems presented by large gas engines and by the utilization of the waste gases of blast furnaces.

Gas engines up to 650 horse-power have been built, and have worked smoothly and economically; while at Seraing in Belgium and at other places the blast furnace gases have been utilized for driving the engines which supply the blast.

The question, therefore, which the engineer now has to settle when deciding upon the site and locality for a new factory, or when deciding upon the system of power generation to adopt for extensions of the old, is no longer so simple as when only one method of power generation in large units was open to him.

It is no doubt true that the choice between the three possible sources of power is one which in many cases will be settled purely by local considerations; and the proximity of a large waterfall or of an extensive coalfield to the factory will be held to point to the turbine or to the steam engine as the most economical power generator. In a great number of cases, however, especially when the decision of the engineer covers the choice of a site for the factory, the problem is capable of no such easy solution; and the most economical source of power can only be determined after an exhaustive study of comparative costs data.

The aim of the writer in the present paper has been to collect and arrange in comparable form some of the more important figures bearing on to cost of power generation. Full references are given to all the original articles from which these figures are drawn.

Tables I to VI in original article contain details of sixty-five actual or estimated costs of steam, water or gas power per hp. year of 8,760 hours.

Taking the best figures for each of the three sources of power dealt with above, and bringing them all to a common basis of comparison, namely, the cost of the ehp. year of 8,760 hours, the author obtained the figures given in the following table:

TABLE VII.—Comparative Costs of Electrical Power.

Source of power.	Lowest cost per E.H.P. year of 8.760 hours.			
	Estimated.	Locality.	Actual.	Locality.
	£ s. d.		£ s. d.	
Water.....	1 5 5	Canada.	1 19 0	Switzerland.
Steam.....	4 18 8	North England.	4 9 7	United States.
Gas (producer)....	5 0 0	England.	....	....
Gas (blast furnace)..	4 1 7	Germany.	....	....

The figures in the table support the opinion, now generally held, that water when developed without excessive capital expenditure is the cheapest source of mechanical or electrical energy. When, however, the hydraulic engineering expenditure has been heavy, or when the power after generation has required to be transmitted over long distances, the margin between the relative costs of water and steam power is greatly narrowed, and in some cases disappears.

Electrical energy generated by falling water is costing more at Rheinfelden, at Zurich, and at Buffalo than it would cost in South Lancashire if generated by steam power in large units, and the margin between the actual charge for power at Niagara and the estimated cost of steam power in large generating stations in South Lancashire is only 12s. 1d. per ehp. year.

In this connection it is interesting to note that the charge for electric power in Buffalo is 13s. 6d. per ehp. year higher than at Niagara; and the excessive charge to small consumers in the same city (£25 11s. per ehp. year) would seem to indicate that the cost of transmission between Niagara and Buffalo represents at least 20s. per ehp. year on the power sent into that city.

Turning now to a consideration of the relative position of gas power, the question of the practicability of large engines may be taken a settled. If they do not cost excessive sums for maintenance and repairs, large gas engines, in conjunction with coke ovens and blast furnaces, may entirely alter the present position of affairs; and the new industries which at present are being established in the neighborhood of water-power stations may find themselves in severe competition with similar manufactures carried on in the coal and iron districts of the older manufacturing countries.

It has been calculated that 2,000,000 hp. is annually wasted in the gases issuing from the blast furnaces of the United Kingdom. If these waste gases could be industrially utilized in the manner suggested, we should to a large extent be compensated for our lack of natural water power.

But blast furnaces demand coke, and coal beds are exhaustible, so that even if this source of mechanical and electrical energy be tapped it can only postpone, but not avert, the final triumph of the waterfall and of the turbine.

* Abstract of paper read before the British Association for the Advancement of Science, held at Bradford, Eng., Sept. 8, 1900.

THE RUBBER INDUSTRY OF THE AMAZON VALLEY.*

Of late years the enormous consumption of rubber in the manufacture of bicycle tires has created a very great demand. The supply not being able to cope with this demand, the price has steadily increased, and considerable attention is now being paid to the production of rubber all over the world. So great is the demand at present that, although the supply from the Amazon Valley alone has increased from 8,635 tons in 1880 to 25,370 tons in 1899, the approximate price of 2s. 6d. per pound in 1889 increased to 4s. 6d. per pound in 1899. The British Vice-Consul at Manäos states that the total world's supply to-day is about 120,000,000 lbs. to 130,000,000 lbs., valued at about £15,000,000. At the present time laticiferous plants yielding "caoutchouc" or "rubber" are being worked for commercial purposes in Brazil, Bolivia, Central America, East and West Africa, whence come the chief supplies, while Guiana, the Eastern Archipelago, Madagascar, India and Ceylon contribute a small quantity to the general stock. More than half the total supply is exported from the Amazon district. In Brazil several kinds of lactiferous trees exist from which rubber is manufactured. In the State of Ceara, the Manihot Glaziovii, locally known as the manicoba, is fairly extensively worked, and considerable attention is being paid to its cultivation. In the State of Maranhao the Hancornia speciosa or mangabeira is beginning to give results. These trees, however, are unimportant compared to the Heva Braziliensis or seringueira, to which the Amazon Valley owes its present prosperity. The Hevea Braziliensis is found scattered through the forests that clothe the banks of the Amazon River and its tributaries. It does not strike the eye among the innumerable varieties of trees to be met with in the Amazonian forests, and is often difficult to detect. A peculiar glistening of the trifoliate leaves and the whiteness of the bark serves as a guide to the practiced eye. The tree grows to the height of 70 feet to 100 feet, and has, as a rule, when full grown, a girth of from 5 feet to 7 feet at a height of one yard from the ground. The tree flowers in January; the seeds are ripe and begin to fall in March in the case of old trees, and in May in the case of young trees. The seeds are contained in a hard shell, three or four in each shell, which hang by a short stalk from the upper and outer branches. When ripe the shell explodes, often with a loud report, scattering the seeds to a considerable distance. For this reason it is difficult to procure seeds. There are for practical purposes three distinct varieties of the "seringueira" to be met with in the forest. These are locally known as the seringueiras "casca vermelha" (red bark), "barriguda" (bellied), and "casca preta" (black bark). The first of these, the "casca vermelha," grows in the higher parts of the forest which are seldom or never flooded. The latex which it yields is scanty, thick, and will not run. It is therefore of little value. The second of these, the "barriguda," so named because the trunk increases very rapidly in thickness towards the base, grows in those parts which are almost constantly flooded, named "igapos." It yields plentifully a thin, watery latex, which is of little value. The third varity, the "casca preta," grows in those parts where a certain amount of drainage exists, and which form an intermediary

* From the "Journal of the Society of Arts."

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zone between the permanently flooded parts and the high lands. It is this variety which yields the latex from which the rubber of commerce is manufactured. The "latex," or as it is commonly known," the "milk" of the tree, is a milky juice contained in special tubes running amongst the other tissues of the plant. These tubes, in the case of the hevea, are connected, forming what is known as the "laticiferous system." The latex is quite different from what is called the "sap," and probably does not play any part in the nutrition of the tree. According to some authorities it forms a reserve of water to be drawn upon in case of drought. The actual extraction of latex cannot kill the tree, and the common statement that the trees are "bled" to death is a mistake. As a matter of fact, though, trees exhausted, inasmuch as they will not yield any more latex are common—actually dead trees, killed by overtapping, are rarely met with.

The latex as it exudes from the bark is of a dazzling whiteness, resembling milk, which it also resembles in composition, inasmuch as it consists of an emulsion in which "caoutchouc" takes the place of the butter in the ordinary milk. The fluid part of the latex consists of water with very small quantities of albuminous matter, organic acids and phosphates in solution. The extraction of the latex, or as it is usually called the "tapping" of the tree, is effected by making an incision in the bark of the tree. From this incision the latex flows for about three or four hours, after that it stops flowing of its own accord. The incision should not penetrate beyond the bark, which is generally about ⅜ inch thick, into the wood of the tree, and for this reason a very small axe, which rapidly thickens wedge like from the cutting edge is used, the shape of the instrument preventing its entering too deep. The axe is generally about ¾ inch wide. The custom is to strike with it a backhanded blow upwards, thus making an oblique cut in the bark. It is probable that a better method would be to use a chisel and mallet and make a V-shaped incision. Experiments at Henaratgoda have shown the advantage of this shaped incision. The incision having been made, a small tin cup, of a capacity of about 4 ounces, is affixed just below it to receive the latex as it flows. This is effected by pressing the edge of the cup—which is sharp—into the bark, until it gets a sufficient hold to remain firm, By this method, however, a second wound is made in the bark, which is injurious. No better method has yet been suggested. In some places a winding groove is cut in the bark of the tree, and by means of a clay breastwork the milk is conducted into a vessel placed at the foot to receive it. This method is found, however, to be very exhausting to the tree, and is falling into disuse. The usual mode of tapping is to make an incision with the axe at the height of some 6 feet from the ground; on a level with that incision and at a distance of some 8 inches a second cut is made, and so on round the tree. Next day the incisions are made just below these and so on day by day, until they reach the ground. Incisions are then made on the same plan, beginning, as before, from the top, and working downwards between the former rows.

A tree that will carry seven cups, 8 inches apart is considered a large one, and although trees that will carry eight or nine cups are to be met with, the average do not carry more than four or five. The latex having been obtained and collected, the caoutchouc, or rubber known to commerce, may be obtained from it in various ways. The only method, however, that has met with practical success is that of evaporation, by which the watery portion of the latex is driven off, and solid caoutchouc remains. The object to be secured is that as little water as possible shall remain in the caoutchouc, the putrefaction of the caoutchouc owing to the presence of these matters being extremely detrimental to its elastic properties, and therefore to its market value. In the Amazon district the method followed is to light a fire upon the ground, and to invert over it a specially-constructed, funnel-shaped chimney. From the narrow end of this funnel, which is open, the smoke and heated gases pour out in concentrated form. The fuel used for the fire consists, as a rule, of chips from any hardwood tree that grows handy to the laborer's hut. The nuts of the "Urucury palm" (Attalea excelsa) are sometimes used, their smoke containing a trace of acetic acid, and creosote being found particularly effective in curing the rubber and preventing putrefaction. It is, however, a mistake to suppose that all or even a large proportion of the rubber coming from the Amazon Valley is cured in this way. It is, on the contrary, very rarely that the rubber cutter will be at the trouble to collect these nuts, he nearly always prefers to use wood chips, which give him less trouble to procure. The fire having been made, and a large stream of hot smoke pouring out of the chimney, the operator seats himself on a small stool by the side of it. The latex is contained in a basin placed at hand. In his right hand he holds a paddle-shaped piece of wood, in his left hand a small calabash. Dipping the calabash into the basin of latex he pours a small quantity over the paddle, which he then revolves in the smoke issuing from the chimney. That having dried in a layer over the paddle he repeats the operation. In the course of time a "ball" or "biscuit" of solid rubber is thus formed. In some parts where it is the custom to manufacture very large balls or pellets, an arrangement is made by means of a pivot to rotate the ball over the chimney. The wooden core is withdrawn through a slit made in the "biscuit," or simply drawn out in the case of the pellet. The latex of a tree named "macaranduba" (Mimusops elata), and more often that of a tree named locally "amapa" is sometimes used to adulterate that of the hevea. In both cases the adulteration is extremely prejudicial to the quality of the rubber produced. Three distinct qualities of rubber are manufactured in the Amazon district, namely, "fine," "entrefine," and "sernamby" respectively. "Fine" rubber has been well smoked, and is free from putrefaction. "Entrefine" rubber has been either burnt while being smoked, or has been insufficiently smoked, and has, therefore, putrified. It is due to carelessness on the part of workmen, which it should be possible to avoid. "Sernamby" is the "negro-head" of commerce, and consists of scraps mixed with dirt, or strips peeled off the bark of the tree and mixed with impurities of all sorts.

THE people of South St. Joseph, Mo., are complaining bitterly of the inadequacy of the ambulance service in that part of the city and ask for the inauguration of an electric ambulance service over the street railway company's track as is in use in other large cities. The question will probably be brought before the city council at an early date.

THE AUTOMOBILE FOR ELECTRIC STREET TRACTION.*

BY J. G. W. ALDRIDGE, A.M.I.C.E.

The author refers to his paper read at the meeting of this section at Toronto, in which he predicted the general adoption of the overhead trolley system for tramways, and states how the system described in the paper before the present meeting will overcome the objections to that system, which are twofold, viz.: (1) The unsightly appearance of the overhead wires and supports as generally constructed. To obviate this objection, which is chiefly an æsthetic one, conduit or surface contact systems are being adopted in some towns, but it is certain that the outlay, both in first cost and maintenance, on these systems will in most cases be prohibitive. (2) The cost of electric traction in small towns and thinly populated districts, owing to the heavy expenditure on the truck and road bed. The expense of laying down an electric tramway system is, from a commercial point of view, inadmissible in many towns and districts, owing to the certainty that the traffic would not repay even a reasonable percentage upon the outlay.

Traffic facilities for the increasing population of the outskirts of large towns may be provided either by—

1. The extension of existing tramways.
2. The existing omnibus routes maintained, or
3. Motor cars adopted to replace these omnibuses.

The Extension of Tramways.—The great difficulty is the cost of the permanent way which will not be less than £4,500 per mile of single track. Assuming a five-minute service each way for 16 hours a day, maintenance at ½d. per car mile comes to £271 2s. 4d. per annum, while interest on £4,500 at 3½ per cent. is £157 10s., making a total of £428 12s. 4d. per mile, excluding all provision for repayment of capital, The cost of track maintenance varies £35 to £530 per mile; in Boston, U. S. A., and several English towns, it exceeds £500, while in Hamburg it is as low at £130. In the towns and districts under consideration this heavy charge for upkeep is likely to seriously reduce the profits on working.

The Existing Omnibus Routes Maintained.—The experience of rapid and smooth transit in the electric tramcar has sealed the fate of the omnibus of the ordinary type, and already some of the omnibus companies, recognizing this, are making substantial improvements in their vehicles. The working expenses are also heavy, no less than 8d. per omnibus mile in one large town, which may be taken as a typical example.

Automobiles to replace Omnibuses.—This is a step in the right direction, but the cars are very costly to purchase, and to maintain where a large number of passengers have to be carried. Several towns which have been experimenting with various types have abandoned them. In electrical motor cars the weight of the accumulators, often equal to that of the car and its passengers, is a great drawback; the cost of their maintenance is excessive, the commercial efficiency is low, and they have to be charged at frequent intervals during which the car is, of course, earning nothing.

The author is of opinion that the system hereinafter described offers a complete solu-

*Abstract of paper read before the British Association for the Advancement of Science, held at Bradford, Eng., Sept. 8, 1900.

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tion of the difficulty; the principal features are as follows:

1. No permanent way is required.
2. Overhead equipment is reduced to a minimum.
3. The electric motor cars have no accumulators to carry.
4. The system is worked from the same generating station and feeders as the tramway system.
5. The first cost is, therefore, enormously reduced.
6. The motor cars or omnibuses may run through any street which allows vehicular traffic.

The system described is an arrangement by which a service of electric motor vehicles derives the power from a pair of trolley wires supported on short brackets along one side of the road; on these wires runs a two wheel trolley containing a small electric motor for its own propulsion, the whole being connected to the omnibus by a flexible cable attached to a pole on the roof, devices being provided for keeping the cable sufficiently taut, and to obviate any risk of derailing the trolley. Continuous current at 500 volts is supplied to the omnibus motor via the trolley wheels and flexible cable, which also contains three small conductors which serve to convey back to the trolley motor the three-phase current which drives it. This is derived from the omnibus motor, which is provided with three collecting rings on the armature at the end remote from the commutator, and connected to suitable points in the winding. By this arrangement synchronism is maintained between the speeds of the vehicle and trolley motor, but on addition, there is provided on the trolley motor an electro-magnetic brake which can be energized at will through a sixth wire in the flexible cable. The system is in actual use in the outskirts of Paris, and the paper is illustrated by numerous lantern slides showing the type of omnibus used there and details of the simple overhead construction; also by a series of cinematograph pictures showing an omnibus threading its way in heavy traffic, an omnibus turning circles and reversing its direction, two omnibuses meeting and exchanging trolley cables, etc.

The omnibuses illustrated are especially built vehicles, weighing about three tons empty and 5 tons loaded, and are furnished with solid rubber tires; at ordinary speeds the power required to propel them is from 130 to 160 watt-hours per ton-mile on level roads.

Old-Time Telegraphers' Association.

The Old-Time Telegraphers' Association and the U. S. Military Telegraph Corps met in Minneapolis, Minn., September 18. F. E. Macfarlane, president of the Bell Telephone Company of Montreal, was elected president of the Old-Time Telegraphers to succeed H. C. Hope, of St. Paul. Mr. Hope introduced Mayor Robert Smith, who welcomed the two associations. In token of the city's hospitality the mayor gave a large golden key to James D. Reid, founder of the Old-Time Telegraphers. Mr. Reid discussed the telegraph wire as an important bond between nations, and then gave President Hope a Morse medallion to be worn by successive presidents of the Old-Time Telegraphers. J. E. Hutchinson, superintendent of the Ottawa Street Railway Company, was chosen vice-president. John Brant, manager of the Western Union at New York, was re-elected secretary-treasurer.

THE NEW YORK STATE STREET RAILWAY ASSOCIATION.

The eighteenth annual convention of the New York State Street Railway Association was held on September 18 and 19, at the Iroquois Hotel in Buffalo. The Association was called to order by President Rogers, Mayor Diehl welcoming the members to Buffalo, and President Rogers responding. The President then delivered the annual address, which was in part as follows:

"Although there has been considerable extension of city roads into the country, as well as building of interurban lines during the past year, some who contemplate still further extensions are awaiting a reduction in the price of steel and other materials, and the settlement of the political question, which now confronts us, before carrying out their plans.

"Before the smaller cities and towns of our State can expect any very radical improvements in their street railroad construction, or can render the service the public demands, the law requiring the street railroads to pay for pavements must be amended. Much has been said and written upon this subject, and I believe the public is aware of the unfair and unjust burden that is being placed on the small roads in these localities. It is the duty of the State of New York to rectify this serious error, which, in nearly every instance, means in the end a receiver, as has been illustrated throughout the State. The smaller cities try to impose the same burdens on street railroads as do the larger cities upon their roads. What might not be a heavy burden to the one means destruction to the other. The suggestion has been made that each municipal body granting a franchise should be authorized by the statute to make a special contract with the applying corporation for either the construction or maintenance of pavements in the whole or different sections of the locality. The lack of elasticity in the present statute militates strongly against the best requirements of small cities for the joint interests of the roads and the public.

"Street railroads have not, in my opinion, anything to fear from the competition of the horseless carriage. This vehicle may be used for carriage and cab purposes to some extent. The 'loco' or 'auto' is still the fad, however. We hope that the many inventors now working on the various vapor motors for the 'auto' may produce something that will prove practicable and economical for street-railway operation.

"It would be an oversight if some allusion were not made at this time to the wonderful development of the street railways of the State during the last year, particularly in cities of the first class. As a matter of fact, the improvement of the street-railway service of New York, Brooklyn and Buffalo during the last twelve months has been almost startling in its character, and is an object-lesson in rapid transit for the country at large.

"The advancement and improvement of the excellent street railways of Buffalo and vicinity will undoubtedly be exhibited in a practical way by our host, the International Traction Company. I have no doubt you will all derive great pleasure from the general inspection of and the ride over the several lines which go to make up the splendid system for which the locality is justly celebrated."

Mr. Patterson, legal representative of the Metropolitan Street Railway of New York, spoke when President Rogers concluded. His subject was "Accidents on Street Railroads, Methods Employed for Handling Same and Preparation for Trial." He said there are now 1,900 cases pending against the company, calling for damages amounting to $16,000,000.

The subject was discussed after Mr. Patterson finished. Secretary Robinson, a solicitor employed by the Metropolitan Company, said that he received 60 claims for damages every day. Other men described their methods of settling claims and told on how trivial pretexts certain claims are made. One railway man said that in his city there was at least one man who made his living by receiving slight injuries and suing the railway company. The treatment of that topic brought out much humor and valuable information.

Other addresses were made. A list of them with the speakers follow:

"Railway Power Transmission," by J. H. Armstrong, Schenectady; "How Can We Increase the Efficiency of Our Employes?" by E. G. Connette, Syracuse; "Storage Battery, Its Use on Small Roads," by B. B. Nostrand, Jr., Peekskill; "Storage Battery," by Thomas Henning, Buffalo; "Description of the Rochester & Sodus Bay Railroad," by T. J. Nicoll, Rochester; "Compressed Air Motors," by H. H. Cook, New York; "Tests of Buffalo Railway Power-house," by Prof. Norris, Cornell University; "Rotary Transformers," by R. E. Danforth, Buffalo; "Practical Experience in the Operation of Combined Public Franchises by One Company," by C. E. Ueberlacker, Elmira.

On the morning of the 19th a short business session was held after which the members visited Niagara Falls.

The following officers were elected for the ensuing year: President, G. Tracy Rogers, Binghamton; first vice-president, John W. Boyle, Utica; second vice-president, E. G. Connette, Syracuse; secretary, Henry Robinson; executive committee, H. H. Vreeland, New York; L. C. Rossiter, Brooklyn; Carl W. Ely, Buffalo, and T. J. Nicholl, Rochester.

The Association will hold its next convention in Rochester.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Calgary Water Power Company has made a new proposition to the town of Calgary, Northwest Territories, for street lighting. The company agrees to erect new poles and adopt enclosed arc lamps.

The corporation of the city of St. Catherines, Ont., is about to undertake the development of additional water power from the Welland Canal above Thorold.

A special committee of the council of the city of Charlottetown, P. E. Island, has been appointed to obtain information in respect to the cost of a municipal electric lighting plant for the city. An estimate already received places the cost in the neighborhood of $20,000.

The electric light station of the town of Cayuga, Ont., was recently destroyed by fire, and the ratepayers of the town have appointed a committee to investigate and report as to the desirability of operating the lighting plant under municipal ownership and control. The most modern power and dynamos will be secured.

The council for the town of Almonte, Ont., has decided to submit to the ratepayers of the

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town a by-law for raising a sum of money to install an electric light plant in the town. This will again bring before the ratepayers the question of municipal electric lighting, which was submitted last year and defeated after a close contest. The vote will be taken at the end of October next.

A threatened strike of street railway men, in Toronto, has been averted by a compromise. The men, who are getting 16 cents an hour, ask 20 cents. President Mackenzie offered 17 cents to those who had been two years in the company's employ, and 18 cents to those of five year's service. This offer was accepted. Mr. Mackenzie, after getting a return of wages paid in the chief American cities, was of the opinion that the Toronto men could maintain as high a standard of living as any car employes on the continent. The majority of the men have served five years with the road. The increase in the wage account will be about $40,000 per annum, but the company's earnings this year are increasing at the rate of about $150,000 a year.

SOCIETY NEWS.

American Institute of Electrical Engineers.

The 146th meeting of the Institute will be held at 12 West 31st street, New York City, this (Wednesday) evening at 8 o'clock. A paper will be presented by Prof. Henry S. Carhart, entitled "The Imperial Physico-Technical Institution in Charlottenburg." The author spent the last few months of 1899 at the Reichsanstalt as a scientific guest, and has thus been afforded an excellent opportunity for studying its practice.

Applications have been received from the following candidates for associate membership, which will be acted upon by the council at its meeting October 24: Charles T. F. Hassler, Riga, Russia; L. H. Wolf, Honolulu, H. I.; A. M. Patitz, Milwaukee, Wis.; August Parshall, London, Eng.; Percy Holbrook Thomas, Pittsburg, Pa.; Philip K. Stern, Warren Ray Thompson, Irving E. Burdick, New York City; Louis Glass, San Francisco, Cal.; Louis B. Wheildon, Boston, Mass.; Howard Scott Webb, Orono, Me.; Carl Emil Wieselgreen, Yonkoping, Sweden; Nathan Marion Snyder, Gering, Neb.; George W. Fowler, Westfield, N. J.; Samuel J. Smith, Charlotte, N. C.; John B. Whitehead, Jr., Baltimore, Md.; Arthur B. Stitzer, Philadelphia, Pa.; C. Sidney Aylmer-Small, Passaic, N. J.; Edward Heitmann, Jr., Pittsfield, Mass.; Walter N. Walmsley, Pomeroy, O.; Henry Rustin, Buffalo, N. Y.

The next meeting of the Institute will be held in New York City October 24.

The New York Electrical Society.

The members of the New York Electrical Society are invited by the American Electro-Therapeutic Association, which is holding its tenth annual meeting in New York City, to attend a lecture at the Academy of Medicine, 17 West 43d street, by Charles T. Child, on "Methods of Generating and Transforming Electric Currents for Therapeutical Uses," at 9 o'clock to-night, Wednesday, September 26.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended September 19:

Antwerp, 23 cases, $1,568; 8 packages, $378; 6 cases motors and parts, $257; Argentine Republic, 546 packages, $31,355; Australia, 6 cases, $886; Brazil, 10 cases, $156; British Guiana, 16 cases, $424; Brussels, 18 cases, $1,170; Cartagena, 23 cases, $4,171; Central America, 103 packages, $2,515; Christiania, 1 box motor cars, $350; Copenhagen, 1 case, $11; 7 packages motors, $1,350; Cuba, 1 case, $85; Ecuador, 1 case, $23; Genoa, 1 case, $42; Hamburg, 107 cases, $13,578; 4 packages, trolley poles, $82. Havre, 70 cases, $3,980; Hayti, 5 packages, $37; Helsingfors, 1 motor car, $275, Hull, 3 boxes motors and parts, $111; Liverpool, 2 packages, $50; 62 cases, $1,072; 6 cases motors, $1,080; London, 119 packages, $5,427; 358 cases, $13,101; 68 boxes motors, $5,918; 3 crates automobiles, $2,300; Manchester, 34 packages, $8,466; Mexico, 17 cases, $999; Naples, 1,333 packages, $72,856; Newcastle, 16 boxes, $1,595; Peru, 32 cases, $1,134, Preston, 1 case, $191; Riga, 38 packages, $3,744; Salonica, 1 case, $10; Southampton, 16 cases, $2,416; Stockholm, 1 box motor cars, $350, U. S. Colombia, 52 cases, $1,474; 37 packages, $1,500.

PERSONAL MENTION.

Prof. F. B. Crocker has returned from Europe.

Col. L. Victor Baughman has been elected president of the electric road to be built from Washington City to Gettysburg, Pa.

Mr. J. E. Nicholas, for years with the Siemens & Halske Company, is now engaged in the accounting department of the Gregory Electric Company, Chicago.

Mr. L. S. Jenkins, of the Jenkins Electrical Company, York, Pa., recently returned home from Chicago, where he has been purchasing machinery for the manufacture of telephone appliances.

Mr. E. E. Schwarzkoff will start a new weekly paper in New York called "Automobile Topics."

Mr. Rutherford Pratt Hayes is at Asheville, N. C., making arrangements to build an electric railway from that town to the sulphur springs, five miles distant.

INCORPORATIONS.

The Washington Electric Light Company, Washington, N. J. Capital stock, $50,000.

The Bluff City Electric Light & Gas Company, Council Bluffs, Ia. Capital stock, $150,000. Incorporators: T. Bowman and J. P. Greenshields.

The Westmoreland Light, Heat & Power Company, Wilmington, Del.—to produce gas and electricity for light, heat and power. Capital stock, $500,000. Incorporators: G. W. Kimball of Wilmington, E. E. Robbins, M. L. Painter, W. Lake and E. H. Bair, all of Greensburg, Pa.

The Hoosick Falls Electric Company, Hoosick Falls, N. Y.—to furnish electric light. Capital stock, $5,000. Directors: Willis E. Heaton and Ezra Tiffany, Hoosick Falls; George W. Davenport, Winchester, Mass.; Owen D. Young, Cambridge, Mass., and Clarence N. Greey, Boston, Mass.

The Archibald Brady Company, Syracuse, N. Y.—to construct street surface railroads, electric lighting plants, telephone, telegraph and gas plants. Capital stock, $50,000. Directors: William K. Archibald, New York City; Paul T. Brady and Robert E. Drake, Syracuse.

The Acme Gas Company, Chicago, Ill.—to operate gas and electric light plants. Capital stock, $50,000. Incorporators: C. W. Smith, F. R. Hughes and W. M. Cowen.

The Eagle's Mere Light Company, Eagle's Mere, Pa.—to furnish light, heat and power by electricity. Capital stock, $1,500. Incorporators: Elizabeth G. Reighard, W. Emery, J. R. T. Ryan, all of Williamsport; B. G. Welch, of Eagle's Mere, and H. Brown, of New York.

COMING ELECTRICAL EVENTS.

American Electro Therapeutic Association—Will meet in New York City Sept. 25-27, 1900.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

National Association of Municipal Electricians—Will meet in Pittsburg, Pa., Sept. 25-27, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

COMMERCIAL PARAGRAPH.

The American Battery Compound Company, Chicago, Ill., manufacturer of American Battery Compound, a battery salt of superior quality to replace sal-ammoniac in all zinc-carbon cells, has removed its office and factory from 31-33 South Canal street to more commodious quarters at 224-226 South Clinton street. This step was made necessary by the rapid growth of the firm's business, which was wholly beyond its expectations. The new factory has a capacity of 15,000 packages of compound per day, and the company say it is now in a position to fill all orders promptly and would like to correspond with supply houses, telephone exchanges and others now buying sal-ammoniac.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED SEPTEMBER 18, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

658,075. Electric-Railway System. William Robinson, Boston, Mass. Filed Sept. 22, 1897.

658,243. Trolley. William A. Daggett, Vineland, N. J. Filed May 23, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

657,908. Speed-Regulator for Dynamos. Philemon W. Alexander, Tifton, Ga., assignor to the Alexander Company, same place. Filed Feb. 7, 1900.

657,984. Electric Measuring Instrument. Jesse Harris, Lynn, Mass. Filed July 20, 1899.

658,012. Dynamo-Electric Machine. Mark H. Hurrell, Wimbledon, England. Filed Feb. 13, 1900.

658,022. Maximum-Electrical-Current Indicator and Recorder. Ernest C. Rimington, London, England. Filed May 3, 1900.

658,064. Switch for Alternating Electric Currents. Bertram Hopkinson, London, England. Filed Dec. 22, 1899.

658,100. Armature for Multipolar Dynamos. James J. Wood, Fort Wayne, Ind., assignor to the General Electric Company of New York. Filed June 14, 1898.

658,225. Circuit-Controller. Charles C. Webster, Asbury Park, N. J. Filed Jan. 19, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

658,301. Telephone Relay. William G. Urmson, New Brunswick, N. J., assignor of three-fourths to John W. Parsons, Henry A. Hull and Josiah Tice, same place. Filed Feb. 5, 1900.

MISCELLANEOUS.

657,910. Metallic Cement for Electric-Conductor Joints. Willard F. Barber, Wilkes-Barre, Pa. Filed Feb. 3, 1900.

657,911. Apparatus for Separating Metals from Ores by Electricity. George D. Burton, Boston, Mass. Filed Nov. 1, 1897.

657,956. Graphophone-Cylinder. Ademor N. Petit, Newark, N. J. Filed Nov. 15, 1899.

658,018. Coin-Controlled X-Ray Apparatus. Fritz Neugebauer, New York City. Filed Jan 25, 1900.

658,027. Therapeutic Device. Andrew W. Steiger, Boston, Mass. Filed Nov. 22, 1899.

658,117. Automatic Maximum-Speed Governor for Electrically-Propelled Vehicles. Horace F. Parshall, London, England. Filed June 12, 1897.

658,193. Electric Conductor. Frederick C. Sutter, Pittsburg, Pa., assignor to the Pittsburg Transformer Company of Allegheny County, Pa. Filed Dec. 30, 1899.

658,235. Secondary Battery. Victor Cheval and Joseph Lindeman, Brussels, Belgium. Filed Jan. 19, 1900.

658,237. Electrical Warp-Stop Motion for Looms. Joseph Coldwell and Christopher G. Gildard, Fall River Mass., Filed Jan. 11, 1900.

658,282. Signal. John M. Sailer, Janesville, Wis. Filed Dec. 15, 1899.

658,299. Electric Gas Lighter. Henri de Thiersant and Hans J. Norballe, London, England. Filed May 14, 1900.

658,315. Electric Furnace. Alfred H. Cowles, Cleveland, O., assignor to the Electric Smelting & Aluminum Company of Illinois. Filed Oct. 22, 1895.

DESIGN.

33,230-33,231. Electric-Cell Body. Ernest F. Yost and William H. Smith, New York City. Filed June 28, 1900. Term of patent 7 years.

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THE TELEPHONE WORLD.

Police Telephones.

The police committee of the general council of Mobile, Ala., is considering the advisability of supplementing the police telegraph alarm system with the service of the telephone. Investigations made and correspondence had upon the subject by the committee show that in a number of cities in the country the telephone proves a very useful auxiliary to the maintenance of good order and the enforcement of law. In Columbus, Ohio, it is stated, the telephone has superseded entirely the police telegraph alarm system, at a material saving in cost and maintenance of apparatus and to the satisfaction of the police department. A letter from a member of the board of police commissioners of that city asserts that the police telephone system, with 120 stations, has been installed and maintained at a smaller fixed charge than Mobile pays at present for its much more contracted Gamewell service; that the more perfect communication between headquarters and the various patrol beats results in material saving in wear of horseflesh and patrol wagons, that there is instantaneous and intelligent communication between headquarters and every policeman on duty, and every incident that calls for attention at headquarters is reported without delay. It is said that the reports received have favorably impressed the committee with the advantages of the telephones.

The New York & New Jersey Telephone Company has at last, after a prolonged struggle, triumphed over its rival in Elizabeth, N. J., the Elizabeth Telephone Company, and will secure from the city council the valuable franchise allowing the company to construct conduits in all the streets of Elizabeth where its wires run and place them underground. The franchise was passed on its first and second readings by the city council, after an exciting session that lasted several hours, the debate being marked by much bitterness. The champions of the local company were President Ryan, Councilmen Horre, Benedict, Collins and Ford. They wanted to have the Elizabeth Company given the use of the conduits or be allowed to construct conduits for its wires, and also tried to have the franchise limited to twenty-five years. They were, however, beaten at all points by a vote of 8 to 5. The company gets the franchise for fifty years. The ordinance will come up for its third reading and final passage October 1, but there is no longer any doubt of its adoption, and the successful telephone company will at once go ahead making arrangements.

The People's Home Telephone Company will shortly open its first exchange in Bessemer, Ala. There are already between one hundred and two hundred subscribers to the People's in Bessemer, and no doubt this number will be increased two-fold as soon as this excellent service is started. Work has been rapidly pushed in the construction department, and all but the details are completed. The exchange will be modern in every respect. Every improvement in mechanism connected with a telephone system is incorporated in the apparatus of the exchange, and the people of Bessemer will receive a service which is not excelled in any city of any size. The Bessemer exchange will be connected with the Birmingham exchange as soon as the latter s completed, which will be about January 1. Connection with the other exchanges at the incorporated towns of Ensley, Pratt City, Woodlawn and Avondale will be made as soon as the exchanges at these points are completed. Work on the Ensley exchange is being rapidly pushed and it is expected that the people of Ensley will be using the People's 'phones in about sixty days, and may be in less time. The service of the People's will cost $18 per year for residence anp $36 per year for business houses.

The Sunset Telephone Company has ordered that all telephones in Woodland, Cal., for which contracts expire on October 1, be removed and discontinued from that date. The company's intention is to do away with all local service and maintain only long-distance communication. The reason ascribed for this radical change is excessive taxation by the county and city. At its last session the county board of equalization increased the company's assessment $10,000, and the city increased it from $6,550 to $19,500. The company claims it cannot maintain a profitable business with such an assessment. A gang of ten linemen at work making extensive improvements in the city were called away in the midst of their work after the company heard of the increase by the city board of equalization.

The Central Georgia Telephone Company of Atlanta, Ga., was recently granted a charter for a term of twenty years. The incorporators set out in their petition that they desire to establish and operate a telephone company with its chief office in Fulton County. The capital stock of the new company is placed at $15,000, with the privilege of increasing this amount to $200,000, as may be determined by a majority of the stockholders. The incorporators are T. C. Parker, O. H. Weaver, E. Y. Mallory and J. J. Cobb.

Mr. R. L. Adams of Gadsden, Ala., who has had considerable success in merchandizing at Alabama City and other towns in that vicinity, is building a system of telephone exchanges in North Alabama. Mr. Adams has built a line from Gadsden to Rome, Ga., and another from Gadsden to Anniston. In addition to the line which he has now running to Birmingham, he has one in the course of construction from Gadsden to Talladega, and it is understood he contemplates building others, making Gadsden the "central" of his system. Mr. Adams defrays the cost of construction out of his own means, and supervises all details. He is on excellent terms with the farmers along his lines, and they see that his wires and poles are kept in working order. It is natural to suppose that the big telephone lines would be against this enterprising young man. But, on the other hand, they encourage him for reasons known to themselves. The line from Gadsden to Birmingham will probably be in operation by the first of November.

The Southwestern Telegraph & Telephone Company has contributed directly to Governor Sayers $1,000 in aid of the Galveston, Tex., storm sufferers, and its president, Mr. C. J. Glidden, has personally telegraphed the Governor a contribution of $500. The loss of the telephone company in south Texas is roughly estimated by General Manager J. E. Farnsworth at $150,000 to $300,000. The exchange at Houston is very badly damaged. It is thought that the outside construction in Galveston is leveled to the ground. The long-distance lines between Galveston and Houston are absolutely wiped off the face of the earth, and all the lines out from Houston are more or less damaged to the extent of about fifty miles in each direction. It is hoped that the long-distance lines may be working into Houston immediately.

A simple and ingenious telephone set for use in crowded situations has recently been placed on the market. The bell-ringing apparatus and battery are inclosed in a case which can be screwed to the ceiling or wall, and from this the transmitter and receiver, which are mounted on a hook-shaped handle so that when the latter is at the ear the former is convenient to the mouth, are suspended from the case by a cord. Inside the case the cord is wound up on a roller like the familiar spring curtain roller. The outfit is installed so that the telephone hangs over a desk, for example, and the act of reaching up and putting down the instrument to the level of the mouth rings the bells and calls the central. When the conversation is finished and the telephone is let go the cord winds it up again, at the same time giving the disconnection signal.

The Kentucky Telephone Association will meet in Winchester, Ky., on October 9. This organization, representing the leading independent companies, has accomplished a great deal in the way of better lines and improved service, both in exchange and toll line work. The extension of new lines during the past few months has been greater than at any period of the independent movement. Many new exchanges have also been added. London and other southeastern towns are now connected with Lebanon, Lexington, Winchester and other Central Kentucky points.

The Sunset Telephone Company is about to bring suit againt the Los Angeles (Cal.) Electric Company to compel the latter to make use of a lower voltage than at present. It is claimed that the electric company's wires are so charged with electricity that it escapes and interferes with transmission on the telephone wires by causing a buzzing which renders it very difficult to carry on a conversation. In case the electric company refuses to reduce its voltage, the telephone company will demand damages.

A telephone company has lately been organized in Sioux Rapids, Ia., composed of the following local business men: Messrs. P. J. Cilley, R. H. Hulett, A. Tymeson, Jr., and W. B. Mills, to operate and maintain a local telephone line in Sioux Rapids. The line will be built and put in operation in less than sixty days. The company will be incorporated under the name of the Sioux Rapids Telephone Company.

Through failure to deposit with Kansas City, Mo., the $50,000 guarantee of good faith required by the franchise ordinance, the Missouri Interstate Telephone Company, which proposed to compete with the local Bell monopoly, forfeited the franchise voted it by the city council a short time ago. The company asked a 60-day extension of time, but the aldermen at their meeting refused this.

President Sabin of the Pacific Telegraph & Telephone Company of San Francisco, Cal., lately accepted the proposition of the mayor to reduce the cost of telephones from $7.50 to $5 a month, to bring the telephone expense within the appropriation.

According to a dispatch from Cheyenne, Wyo., the long-distance telephone line between Salt Lake and Denver will soon be completed. The connecting link between Rock Springs and Green River is now being put in and it is expected that the people of Salt Lake and Denver can hello to each other in a few days. The line passes through Cheyenne, Laramie, Gold Hill, Saratoga, and the rich mining camps of Grand Encampment and Battle Lake, Rawlins, Rock Springs, Green River and Evanston to Ogden and Salt Lake.

The Mississippi Valley Telephone Company is doing a large amount of work in St. Paul, Minn., and is only waiting for the necessary wire to connect 3,000 additional subscribers. Charles F. Weismann, St. Paul manager and secretary of the company, says the wire was ordered six weeks ago and paid for in advance. It is expected that the shipment of it will begin shortly, and as soon as the material arrives crews of men will be put at work to complete the extension of the exchange. Mr. Weismann says that 3,000 new 'phones will be connected inside of sixty days.

News from Vermont states that Barre's Independent Telephone Company is bound to be a go, as sufficient stock has been subscribed for to insure the construction of a first-class line, and it will have 221 telephone subscribers to start with. The committee having the matter in charge recommended that a start should not be made until 200 shares of stock had been subscribed for. This has been accomplished, as exactly 201 shares have been taken.

H. W Pope, general manager of the Bell Telephone Company of Buffalo, N. Y., announced recently that as soon as the switchboard is set up and in use in the main exchange it is expected that the telephone service will be greatly improved and that inconveniences that patrons have suffered during the course of recent improvements to the system will be eliminated.

The Missouri & Kansas Telephone Company has commenced an extension of its line from Oswego to Independence, Kan., and west to Winfield. This will give Independence and the other towns along the new line direct telephone connection with Kansas City and the towns in eastern and western Missouri. Several car loads of telephone poles have arrived in Independence, and a gang of workmen are to set them in position.

Messrs. R. M. Chowning, of Fulton, Ky., and J. E. Wright, of Mayfield, Ky., the majority stockholders and managers of the West Kentucky Telephone Company of that section, have been offered the management of a large telephone company at Evansville, Ind., involving a deal of $150,000. Mr. Wright has lately been to Evansville examining into the deal.

A telephone line is being constructed from the Charleston & Western Carolina depot at Crocketville, S. C., a distance of about four miles. Messrs. Fred Lightsey, of Crocketville, and Eugene M. Peeples, of Hampton, are the proprietors of the new enterprise.

The stockholders' meeting of the Mutual Telephone Company of Des Moines, Ia., which was called about a month ago, and postponed, will be held to-day, September 26. The directors are anxious that a full meeting shall be held at that time. The proposed changes in telephone rates to stockholders will come up for settlement at that meeting.

The mayor and aldermen of Biddeford, Me., granted to the Biddeford and Saco Telephone & Telegraph Company a permit to locate its poles and wires on a number of streets, ignoring the petition of the New England Telephone Company for rights covering the same territory.

The Hudson River Telephone Company of Newburgh, N.Y., is making arrangements for putting up a cable along some of the streets of that city. There will be about 120 wires in the cable, which will replace the 40 or 50 wires which have disfigured the streets for some years.

The telephone company established in Marietta, O., by J. W. Dusenbury and other Columbus people, opened for business a short time ago. The Bell Company has begun to cut rates.

On account of the large increase in business at the Cotton Exchange of this city it has been found necessary to augment the present telephone service by the installation of eight new instruments.

The new telephone system for High Springs, Fla., is being rapidly placed in position, the poles for same having been put in the ground.

Poles for the long-distance telephone lines have been distributed between Easton and Yakima, Wash.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Abbeville, La.—M. T. Lewman & Co., of Mobile, Ala., has made a proposition to the city for the erection of a $42,000 water and electric light plant.

Adrian, Mich.—The Gilliland Electric Company of this city, is advised of the destruction of its branch plant by fire, at Belington, W. Va.

Alliance, O.—Bids are being received for the erection of an electric light plant at this place.

Altoona, Pa.—The Altamonte Hotel is preparing to put in an electric light plant of its own.

Ava, Ill.—The Ava electric light plant was totally destroyed by fire. Loss $3,000.

Billings, Mont.—Bids are asked until October 2 for furnishing 50 electric lights for a period of six years. Address J. B. Herford, clerk.

Canton, Ga.—The Georgia Marble Finishing Works of this place wants to buy a dynamo for 50 incandescent lights.

Cape May, N. J.—Lemuel E. Miller has selected a site in the western portion of Cape May on which he will erect an electric light plant to supply public lighting.

Carbondale, Pa.—The electric light power house is to be greatly improved in the near future. The old machinery is to be replaced by more modern apparatus.

Chicago, Ill.—At a recent meeting the village board of Harlem voted to advertise for bids for the construction of an electric light plant to furnish 2,500 incandescent lights to private parties. The proposition was made by Trustee F. Meyer.

Clinton, Ill.—The Clinton Electric Light Company will install new arc light machinery.

Cumberland, Md.—The city officials are considering plans for enlarging the municipal electric lighting plant.

Dallas, Tex.—The Dallas Electric Light Company will install a new plant of 1,200 incandescent lights.

Dyersburg, Tenn.—Plans are on file for an electric lighting plant to be installed in this town. Address W. A. Faulkes, mayor.

Henderson, N. C.—The Seaboard Knitting Mills recently contracted for the installation of an electric light plant.

Houston, Tex.—Bids are asked until November 5 for constructing a complete electric light plant in this city. Address A. Lipper, city secretary.

Kennett, Mo.—The council is considering the question of having some additional lights put in throughout the city. If the plans are carried out the local plant will need additional machinery. C. Sickles, manager.

La Crosse, Wis.—Alderman Schultze offered a resolution, which was adopted, instructing the mayor to appoint a committee of five to investigate the matter of establishing a municipal lighting plant.

Little Falls, N. Y.—As predicted some time ago it now seems certain that the Herkimer County Light & Power Company will secure the Dolgeville electric plant.

Longueuil, Que.—At a recent meeting of the council a report submitted by the light committee, recommending that tenders to light the streets by electricity be called for, was adopted.

Los Gatos, Cal.—The town board is considering the proposition of several improvements, among which is the owning of an electric light plant.

McKeesport, Pa.—The finance committee of the city councils added on to the proposed bond issue a short time ago another $50,000 to be used in erecting a municipal electric light plant.

Monticello, Ill.—The Monticello Electric Light Company has decided to put in a heating plant for warming stores and residences.

Muscatine, Ia.—The Muscatine Electric Light & Power Company is now preparing to proceed to build a new plant to meet the needs of the present business.

New Haven, Conn.—The United Gas Improvement Company will make a strong effort to establish a new electric light plant in Bridgeport and this city this winter.

New London, Conn.—Bids are asked until September 29 for delivering at this city 250 incandescent lamps. Address Major S. A. Leach, U. S. engineer.

New Portland, Me.—C. H. Bartlett, proprietor of the novelty mill here, will soon add an electric light plant to his establishment.

North Toronto, Ont.—The property owners of this place recently held a meeting for the purpose of forming a town improvement association, which shall take steps to secure better roads and sidewalks, electric lighting, the beautifying of the residences and grounds and the general improvement of the town.

Rockville, Ind.—A recent fire destroyed the city electric light plant, but fortunately the city has an entirely new light plant under course of construction, the machinery being almost completely installed, so that by crowding the work the city will soon be lit by electricity again.

Sioux Rapids, Ia.—A deal has been completed whereby O. M. Packard disposed of his interests in the electric light plant at this place to L. L. Mertz, of Keithsburg, Ill. The new owner will give the plant his personal supervision.

Thessalon, Ont.—The city council will soon take up the question of installing an electric light plant.

Thomasville, Ga.—The Thomasville Electric Light Company has been placed in the hands of a receiver.

STREET RAILWAYS.

Belfast, Me.—H. L. Kochersperger is interested in the proposed electric road to be built from here to Northport.

Bristol, Va.—The Bristol Belt Line Railway Company has obtained a franchise to use a number of the town streets for its electric system.

Brooklyn, N. Y.—A resolution to compel the Brooklyn Rapid Transit Company to put its trolley wires under ground was introduced by Alderman Alt at a meeting of the board last week. It was referred to the committee on railroads.

Cleveland, O.—The Cleveland City Railway Company will begin the work of changing the Payne Avenue cable line to electricity about October 1. G. G. Mulhern, general superintendent.

Frankford, Del.—The citizens have offered to contribute $5,000 toward the construction of the proposed trolley road from this place to Ocean View.

Grass Lake, Mich.—The common council at a recent meeting granted a franchise to W. A. Boland to operate an electric road through this village for a term of 30 years.

Grimsby, Ont.—The Cataract Power Company contemplates building an electric railway from Hamilton to this place, as a rival to the Hamilton, Grimsby & Beamsville line, and later on may extend to Niagara Falls.

Lewiston, Me.—It is said that the prospect of building the electric road to this place by way of Winthrop is brighter than ever.

Lowell, Mass.—A petition for a new electric railroad has been filed with the selectmen of Billerica and other towns. Starting at the termination of the Boston Elevated in Belmont, the proposed line is through Woburn, Burlington, Lexington, Lincoln, Concord, Billerica and Chelmsford to this city.

Nyack, N. Y.—C. W. Reeve is interested in a proposed trolley system for this place.

Ripley, O.—A promoting company was organized here a short time ago to construct an electric railway northward on a capital of $10,000.

Rochester, N. Y.—A trolley line that will connect this city with Buffalo by way of the famous Ridge Road in the northern section of Niagara County is believed to be assured. Rights of way have been secured. Branch lines will be run to Medina and Albion. It is promised this road will be in operation early next summer.

Sherman, Tex.—J. P. Harrison and others are considering the formation of a company to build an electric line in the eastern part of this city.

Sidney, N. Y.—The Susquehanna Valley Electric Company will build a trolley line between here and Franklin. H. B. Oakham, C. F. Lehman and Ed. H. Tucker of New York are interested.

Stafford, Conn.—It is possible that this place may be enlivened by an electric line if the enterprise being shown will result in such an improvement. Maro S. Chapman is one of the parties interested.

Steubenville, O.—Many new electric railway lines and extensions are projected for eastern Ohio and Pennsylvania.

Trenton, N. J.—The Philadelphia & New Jersey Street Railway Company has started a force of men at work on the construction of one of the most important trolley links in the line to Philadelphia.

Uniontown, Pa.—The Uniontown & Monongahela Valley Electric Railroad is the name of a new line soon to be constructed, and will run from here to Masontown passing through New Salem and McClelland.

Whitehall, N. Y.—By the trolley connection of Whitehall to Granville freight will go direct to Troy or even to New York City by the Champlain Canal and Hudson River. Branches are to be established in Vermont.

White Lake, N. Y.—The project of a trolley road from here to Shohola, on the Erie, is again being agitated.

MANUFACTURING.

Chicago, Ill.—J. Holt Gates & Co. of this city has been awarded the contract for the new addition to the electric light plant at Naperville, Ill. There will be installed one 120 kw. Warren alternator and a marble switchboard. There will also be installed a 300 hp. cross-compound Corliss engine; the entire plant will be run from this engine by belts running to a countershaft. This additional apparatus also contemplates a complete overhauling of the entire outfit into a modern, up-to-date plant. The same firm has been awarded the contract for the new addition to the electric light plant at White Water, Wis., which includes a 90 kw. Warren alternator.

Los Angeles, Cal.—The Palmer-Nicholls Company of Providence, R. I., is to establish a branch factory here for the manufacture of all kinds of electric wires.

Madison, Wis.—The Northern Electric Manufacturing Company of this city, Western agent for the Stanley Electric Company of Pittsfield, Mass., was recently given the contract for the new machinery for the municipal lighting plant.

New York City.—Edward Rafter, of this city, Gennaro Romanelli and Dennis M. Shea of Madison, N. J., are interested in the Romanelli-Rafter Electric Chemical Company, which was lately formed here to manufacture electrical batteries.

Pittsburg, Pa.—The L. G. Martin Company of this city will manufacture gas engines and electrical machinery on a capital of $5,000.

Wilmington, N. C.—J. Hicks Bunting of this city wants to communicate with manufacturers of combination gas and electric fixtures.

COMPANY MATTERS.

Far Rockaway, N. Y.—A special meeting of the stockholders of the Queens Borough Electric Light & Power Company will be held on October 4 for the purpose of voting on a proposition to increase the capital stock of the company from $250,000 to $410,000.

Worcester, Mass.—President Washburn of the Washburn Wire Company announces that his company has acquired a controlling interest in the American Electrical Works at Phillipsdale.

POWER AND TRANSMISSION PLANTS.

Belvidere, N. J.—It is proposed to erect an electric power plant here to use the water power of the Delaware River at Big Foul Rift, a few miles below this place. Options have been secured on a number of farms adjoining the river. The plan is to furnish electric power for the lighting of Phillipsburg, Washington, Hackettstown, Belvidere, and other near-by places.

Shingletown, Cal.—A company of Eastern capitalists has purchased 600 acres of land on Mill Creek near here for the location of a new power plant. The company will begin business with a 2,000 horse power generator and increase the capacity as required.

MINES.

Montreal, Can.—Water Superintendent Marien has prepared a report upon the probable cost of installing an electric pumping plant at the high level reservoir. He estimates the total cost at $30,000. This would provide two electric motor pumps with a capacity of 5,000,000 gallons a day. The report will be carefully studied. The work may be done in sections, by putting in one pump at a cost of $18,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers a. compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed;' inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.- Sept 24						
United Traction.. .. (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000 000	1½ % Q.,	12	121½
Allentown Pa.- Sept 24						
Allentown & Lehigh Val Trac. Co		4,000,000	1,500,000	....	..	15
Bridgeport, Conn- Sept 24:						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md - Sept 24						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.- Sept 24.						
New England Street Ry............	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com	50	10,000,000	9,085,000	3½ % S., Oct., '99.	98	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	1 4
Boston Elevated R. R................	100	10,000,000		2¼ % Aug. 99,	145½	146
Brooklyn N. Y.- Sept 24:						
Brooklyn City Ry..........	100	2,000,000	1,928,400	....	232	234
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	48¾	[illegible]¼
c Brooklyn Heights Railroad....	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
c Brooklyn, Queens Co. & Sub. RR.	...	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.......	100	2,000,000	1,884.200	2½ % Nov., '99.	322	825
Kings County Elevated...............	....	4,750,000	4,750.000	....	..	...
Kings County Traction Co.........	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad........	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.- Sept 24.						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co................	100	6,000,000	5,870,500	1 % Q. Dec., '99	99	100
Columbus O.- Sept 24:						
Columbus Street Railroad...........	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	88	85
Charleston, S. C.- Sept 24						
Charleston City Ry. Co.............	50	100,000	100,000	3 % S.	..	..
Enterprise City RR. Co.............	25	1,000,000	250,000	....	..	..
Chicago, Ill.- Sept 24						
Chicago City Ry. Co.................	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99	211	245
Chicago & South Side R. T. RR....	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR.............	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	82½	18
Met. West Side El., pfd	100	15,000,000	9,000,000	....	82½	83
North Chicago Street RR............	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR...........	100	500,000	249,900	....	190	200
South Chicago City Railway........	100	2,000,000	1,608,200	....	89	01
West Chicago St. RR. Co............	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.. .. ..com	....	1,250,000	624.900	35 %	12½	18
Union Traction Co. .... pref	100	2,000,000	2,000,000	5 % S.	50	52
Cincinnati, Ohio.- Sept 24:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150.000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	3,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co...........	50	18,000,000	14,000.000	1½ % Q., Jan.	174	12.
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	26	127
Cleveland, Ohio.- Sept 24						
Akron, Bed. & Clev. Elec. Ry.......	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry....................	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry...............	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.- Sept 24						
Detroit Citizens' Street Ry..........	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry..........	100	....	1,200,000	....	175	..
Rapid Railway Co....................	....	250,000	250,000	....	90	100
Detroit Electric Railway............	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.- Sept 24						
City Railway Co...................com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co...................pfd.	100	600,000	600.000	1½ % Q.	170	..
People's Street Railway........ ..		1,100.000	1,100.000	......	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore The pref stock of U. R & Elec. Co has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn - Sept 24						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	
Hartford & West Hartford RB	100	1,000,000	247.000	....	..	-
Holyoke Mass.- Sept 24						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.- Sept 24						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	
Indianapolis, Ind- Sept 24.						
*Indianapolis Street Ry	...	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.- Sept 24						
Pennsylvania Traction Co..........	100	10,000,000	9,900,000	....	--	-
Lancaster & Col. Electric Ry.....	....	....	87,500	....	..	-
West End Street Railway.........	...	....	....	....	--	-
Louisville, Ky.- Sept 24						
Louisville Ry.....................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry... .... pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.- Sept 24						
Twin City Rapid Transit..... com.	100	17,000,000	15,010.000	....	68⅝	68½
Twin City Rapid Transit....7 % pfd.	.	8,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.- Sept 24						
Montreal Street Ry. Co............	50	4,000,000	4,000,000	8 % S., M. & N.	267	297½
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¾ % S., J. & J. †	100¾	109½
Memphis Tenn.- Sept 24:						
Memphis Street Railway Co.	100	500,000	500,000	....	25	-
New Haven, Conn.- Sept 24						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville.........	100	700,000	800,000	....	..	
Winchester Avenue RR...........	25	1,000,000	600,000	....	45	46
New Orleans, La.- Sept 24						
Canal & Claiborne RR. Co.........	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	53
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
a Crescent City RR.............guar.	100	2,000.000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	--
Orleans Railroad.....................	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway..........	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York- Sept 24:						
Central Crosstown RR...............	100	600,000	600,000	2½ % Q.	55	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q. Nov.	120	185
d Metropolitan Street Ry. Co.......	100	45,000,000	45,000,000	2½ % Q. Feb., 1900.	141	146½
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	32	36
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.............	100	1,000,000	1,000,000	.. ..	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR........ ..guar.	100	800,000	800,000	....	1 5	205
k Sixth Avenue RR............guar	100	2,000,000	2,000,000	....	.05	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR..................	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR....................	100	12,000,000	10,000,000	$1 75 p. sh. Feb.	109	109½
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.- Sept 24:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60¾
North Jersey Railway Co...	100	6,000,000	6,000,000	....	28	29½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	16	19
Pittsburg, Pa.- Sept 24:						
Allegheny Traction Co.......... ...	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	8½
Consolidated Traction Co.......pfd.	50	9,178 85[illegible]	9,000,000	3 %, Nov.	60	61
p Central Traction Co.	50	1,500,000	|900,000	1½ % Nov.	69	70
q Citizens' Traction Co..............	50	3,000,000	‡3.000,000	6 % A.	72½	72½
r Duquesne Traction Co...........	50	3,000,000	‡3,000,000	6 % A.	.	
s Pittsburg Traction Co............	50	2,500,000	1,900,000	3½ %, Nov.	½	
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000	|2,994,889	2 %, Aug.	..	
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry..........	50	3,000,000	3,000,000	5 % A., June	..	.
United Traction Co.................com	50	17,000,000	17,000 000	J. & J.	4	14½
United Traction Co.................pref	50	3.000.000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. | Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct 1 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock

j Leased to Met St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Sept 24						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Sept 24						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Sept 24:						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Sept 24 :						
Paterson y. Co.	100	1,250,000	1,250,000	....	54	--
Prov nce, R. I.— ept 24 :						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Sept 24						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '19	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000 000	29,930,450	....	36⅞	37
cElectric Traction Co.	50	....	8,297,920	....	--	...
dCitizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	--
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry.	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry.	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	--
gGermantown Passenger Ry.	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	95¼	95½
jCatherine & Bainbridge St.	50	....	‖400,000	6 % A—Mar., '98.	...	--
iContinental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	--
jPhiladelphia City Pass. Ry.	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	--
jRidge Avenue Passenger Ry.	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	--
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	--	--
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	--
jUnion Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Sept 24						
Rochester Railway Co.	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Sept 24						
jReading Traction Co.	--	1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26
kCity Passenger Ry.	50	850,000	850,000	Jan., '98.	138	...
lEast Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Sept 24						
Fourth Street & Arsenal Ry.	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan.,'99.	--	--
National Railway Co.	--	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	--	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	--	--
United Electric Ry.....com.	50	500,000	500,000	....	20	21
United Electric Ry.....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
t. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '19	--	--
San Francisco, Cal.—Aug.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	--
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Sept 24						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16⅛	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Sprin field Ill.—Sept 24:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Sept 24						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Sept 24:						
pringfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Sept 24:						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S. §	100¼	102¼
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Sept 24						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry.	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Sept 24						
*Worcester Traction Co.....com.	100	8,000,000	8,000,000	....	30	31½
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4½ %, 1899	...	85
Wilkesbarre, Pa.—Sept 24:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.
a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at $5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Lease transferred to Union Traction Company.
jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.
k Dividend of 10 % guaranteed by Reading Traction Company.
Dividend of 6 % guaranteed by Reading Traction Company.
Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 24						
American Bell Tel Co.	100	50,000,000	23,650,000	4½ % Q., Jan.	137	138
Erie Telegraph & Telephone Co.	100	......	......	1 % Q., Feb. 20,	96	98
New England Telephone Co.	--	10,894,600	10,804,600	$1.50 p. sh. Feb	123½	125
New York.—Sept 24						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¼ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q., Feb.,	--	--
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co.	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	--	--
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	3 % S., Jan., '99.	115	--
Western Union Telegraph Co.	--	......	97,370,000	1¼ %, Q, Jan. '99.	78	78¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Sept 24 :						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	--
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	116	125
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	......	......	....	94½	95
Southern New Eng. Teleph. Co.	100	3,000,000	......	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Sept 24:						
Fort Wayne Electric trust receipts.	--	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	--
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	135	135¼
T.-H. Elec. Co..T. Secur., Series C.	--	......	......	....	22	26
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Sept 24						
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1½ % Oct., '98.	--	--
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co.....com.	--	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q.,Apr., 1900.	155	135¼
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,0 00	A. & O.	110	125
Pittsburg, Pa—Sept 24						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Sept 24						
Edison Electric Light Co.	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	50	60
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	55	65
Northern Elec. Light & Power Co.	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Sept 24						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	--	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	350,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	--
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.	100	......	......	....	118¾	120
Royal Elec. Co. (Montreal)	--	1,000,000	......	2% Q ‡	193	202
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	133¾	135
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1, 96.	--	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.
‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Sept 24:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$8.50 p.sh.	--	100
New York.— Sept 4 :						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	--	--
Worthington Pump Co.........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Sept 24						
Electro Pneumatic Trans. Co.	10	1,500,000	......	---	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	---	--	162
Welsbach Commercial Co.....com.	100	8,500,000	......	---	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co.	5	525,100	......	....	43	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1¼
Pittsburg, Pa.—Sept 24						
Carborundum Mfg. Co.	100	200,000	200,000	....	--	--
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Sept 4.						
*Barney & Smith Car Co.......com.	100	......	1,000,000	---	13	16
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	....	....	32	--
Consol. Car Heating Co.	100	1,250,000	1,250,000	1½ % Feb	55	58
Johns-Pratt Co.	100	....	....	---	105	109
*Pratt & Whitney Co.........com.	100	......	....	---	2	4
*Pratt & Whitney Co.........pfd	100	....	......	---	40	50
Stillwell-Bierce Co.........com.	--	....	....	---	--	50
Stillwell-Bierce Co.........pfd.	--	....	....	2 % Sept 1,'99.	70	65
Shults Belting Co.	100	500,000	....	....	80	90
St. Charles Car Co.	--	....	....	......	80	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Sept 24, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s	$500,000	427,500	1940	J. & J.	*118	....
†The Albany Ry. Co......Gen. mtg. 5s	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‡Watervleit Turnpike & RR..2d mtg. 6s	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Sept 24, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	$8,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co...... 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121¼
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston, Mass.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.		
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108⅛	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	1:4	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‡So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
*a*Brooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
*a*East Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Sept 24 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry.................1st mtg. 5s	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Sept 24, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.. cons mtg. 6s	$150,000	$150,000	191[illegible]	M. & N.	......	....
Crescent City RR.............1st mtg. 6s	......	50,000	189[illegible]	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	194[illegible]	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	899,000	190[illegible]	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	194[illegible]	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	191[illegible]	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	800,000	75,000	190[illegible]	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	10[illegible]⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109⅛	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98⅛	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	800,000	800,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	350,000	350,000	1919	......	110⅛	112⅛
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Sept 24 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry.....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	... .	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry..............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co.................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	——	......
West End Passenger Ry.......1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Sept 24 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111⅛	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	....	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	.....	....

Providence R. I.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Sept 24, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101⅛	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101⅛	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter...1st	1 000 000	000 000	191	J & J	17	

*With interest. *Unlisted.

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PASSENGER RAILWAY.

NAME	Amount. Authorized.	Amount. Issued.	Due	Interest periods	Bid.	Asked.
St. Louis. *Date of Quotation* - Sept 24 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co.......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1906	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N	99½	100½
‖St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N	...	......
†Controlled by Market St. Ry. Co.						
Washington D C. *Date of Quotation*- Sept 24 1900						
Belt Ry. Co.......................... mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.......................... mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg.bds.						
Miscellaneous *Date of Quotation*—Sept 24, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$37,000 in treasury.
§$960,000 res'ved to redeem prior liens
††$620,000 in escrow

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Boston, Mass *Date of Quotation* - Sept 24 1900						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800.000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,020,000	......		Quar.	157	...
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation* Sept 24, 1900						
Allegheny County Light Co....... ....6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co.Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Sept 24 1900)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	...	
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	103
Kings Co. El. Lt. & Po. Co.pur money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con g. 5s	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000		....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Miscellaneous. *Date of Quotation*- Sept 24 1900.					100½	101
American Bell Telephone.....................4s.			1908	F. & A.	......	...
Northwestern Telegraph Co................7s.	....	....	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......		......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D	108	106

ALLIED INDUSTRIES.

NAME	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Miscellaneous *Date of Quotation*—Sept 24, 1900						
American Electric Heating ....7s.	500,000	500.000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co.........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co...........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co..............................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¼@16⅜c.; Lake, 16⅜@16½c.; casting, 16⅛@16¼c.

The output of copper for 1900 expected to reach 325,000,000 pounds, worth $42,250,000, the largest on record.

All but 2,500 shares of Pratt & Whitney Co. stock have assented to the consolidation with the Niles Bement-Pond Company.

The Chicago Telephone Company declared a quarterly dividend of 3 per cent., payable October 1. Books reopen October 10.

A dispatch from Chattanooga, Tenn., states that the Signal Mountain Railway has been bought by the Chattanooga Rapid Transit Company.

The Massachusetts State Railroad Commission has authorized the Pittsfield Street Railway Company to issue $50,000 additional stock for extensions and equipment.

Stockholders of the Electro-Pneumatic Transit Company have received a circular from a law firm, inviting them to give options at $5 a share for ninety days.

The Otis Elevator Company has declared a quarterly dividend of $1.50 per share on its preferred stock, payable October 13. Books closed September 22 and reopen October 15.

The State Board of Railroad Commissioners will give a public hearing in this city Saturday on the application of the Brooklyn Rapid Transit Company to discontinue several elevated stations.

Advices from Pittsburg state that a Detroit contractor is negotiating for $610,000 worth of electrical equipment for a proposed traction road from Cincinnati to parallel the Miami & Erie Canal for 244 miles.

The Amalgamated Copper Mining Company has declared the regular quarterly dividend of 1½ per cent. and an extra dividend of ½ per cent., payable October 29. Books close September 28 and reopen October 31.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 13@15; New York Electric Vehicle Transportation, 6½@7; New England Transportation, 3½@3¾; Gramophone, 35@40.

Directors of the American Telephone and Telegraph Company have declared a regular quarterly dividend of 1½ per cent. The dividend is payable October 15 to stock of record September 29. Books close October 1 to 15 inclusive.

The first fall meeting of the New York Rapid Transit Commissioners was held on the 20th inst. Contracts are let for nearly all the sections of the tunnel, and its Brooklyn extension will be acted upon at the next meeting.

The Manhattan Company is said to have completed arrangements with the Metropolitan Company by which the latter will furnish all the power and equipment needed to test the third rail system on the Manhattan road in New York. When this is successfully done work on the Manhattan plans will be proceeded with more rapidly.

An officer of the Chicago Union Traction Company denies the report that the next dividend on the preferred stock will be passed or reduced. A meeting of the board of directors has been called for September 28, in Chicago, to act on the dividend and also to elect officers for the present year. Failure to get a quorum has prevented the election of officers before.

Stockholders of the Union Traction Company of Philadelphia held their annual meeting on the 20th inst., and re elected the following directors: P. A. B. Widener, William L. Elkins, Thomas Dolan, George W. Elkins, John B. Parsons, Jeremiah J. Sullivan, William H. Shelmerdine, George D. Widener, Alfred Smith, Alexander M. Fox, Charles O. Kruger, and Alexander Balfour. Aside from reading of the annual report, the only interesting feature of the meeting was the presentation of a resolution to issue monthly earning statements.

Alderman Lamb, chairman of the City Board of Works of Toronto, Ont., reports that he has received satisfactory assurance from New York that a company to build a radial electric railway system, tributary to Toronto, would be financed in the city of New York. He urges, however, that Canadian capitalists take control of the enterprise and raise the $5,000,000 required to carry out the work. The scheme involves the construction of almost 500 miles of trolley lines, the chief one giving Toronto connection with Georgian Bay and Lake Simcoe.

More than 45,000 shares of Brooklyn Rapid Transit stock were traded in on the New York Stock Exchange on Monday and it is said that much of the selling represented long stock. In the morning, when the price slumped more than a point, a rally followed on the publication of the statement that the next quarterly earnings report would show some "surprises," the inference being that these surprises would be favorable—as, in fact, a director of the company declared would be the case. In the afternoon, however, the street heard that the promises of a favorable showing might prove to be like recent other promises in respect to the stock—disappointing. At the same time a selling movement set in, which speedily carried the price to the low figure of the day. Around 48 the stock apparently had good support.

The detail figures of the Metropolitan Street Railway Company's balance sheet for the year ending June 30 are as follows: Assets: Cost of road and equipment, $35,632,168; stocks and bonds, $21,644,457; new construction on lines owned and leased to be distributed, $18,168,360; supplies on hand, $1,03,788; improvements and betterments charged to leased lines, $2,776,164; cash on hand, $12,489,276; bills receivable, $271,886; office furniture, $18,3 4; open accounts, $37,294; total, $91,091,587. Liabilities: Capital stock, common, $44,960,900; funded debt, $21,750,000; bills payable, $8,756,736; interest on funded debt account, $401,274; dividends unpaid, $786,815; due on open account, $374,230; rentals and taxes accrued, $621,830; Third Avenue Railroad lessor construction account, $11,419,833; profit and loss surplus, $2,019,919; accounts payable, total, $91,091,587.

ELECTRICITY.

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EDITORIAL NOTES.

The Overhead Trolley System of Brooklyn.

The Brooklyn Rapid Transit Company would seem to be having a more or less hard row to hoe. About a year ago a clique of speculators, by circulating rumors and false statements, came very nearly bankrupting the concern, while only recently the following resolution was passed by the Board of Aldermen of Greater New York:

"Resolved, That the Corporation Counsel be and he is hereby respectfully requested to begin such proceedings as are warranted under law, which will require that all surface street railroads in Greater New York, now operated by the overhead trolley system shall be operated by a system of underground currents."

This resolution, if it can be enforced, will mean that the many miles of overhead trolley system in Brooklyn will have to be replaced by the underground conduit system such as is made use of by the Metropolitan Street Railway Company of the Borough of Manhattan. The N. Y. "Commercial" referring to the subject says:

"The resolution, if adopted, could not be enforced. The power to change motive power on railroads is vested in the State Railroad Commission, and then only if the railroads apply for permission to do so. The commissioners cannot compel a railroad to substitute the underground for the mid-air system. The Legislature can, and the Legislature on behalf of the people is to be appealed to do away with trolleys above ground. The Corporation Counsel is to be asked to present the matter in the light in which the local government sees it; that trolleys are dangerous to life, and that telephone and telegraph wires strung along poles interfere with the work of firemen at fires."

There is no doubt but what the intricate network of overhead wires in Brooklyn is unsightly, and more or less of a menace to the public, to say nothing of the damage constantly being caused through electrolysis by the overhead trolley. Yet in spite of these facts drastic measures should not be hurriedly enforced, as it would mean the loss of thousands of dollars to stockholders, who have purchased in good faith the securities of the Brooklyn Rapid Transit Company.

Could this measure be enforced how seriously it would affect the finances of the company may be inferred when it is stated that the cost of changing the system would probably amount to not less than eight or ten million dollars.

It is stated that the resolution introduced at the session of the Board of Aldermen, had no political significance, and that it was purely in the interest of the public. Such may be the case, but the attack was significant to say the least, and in view of the general street railway conditions in Greater New York, it would not surprise us to see before a great lapse of time the Brooklyn Rapid Transit Company pass under the control of another well-known street railway corporation.

* * *

The Plans of the National Telephone & Telegraph Company.

When the National Telephone & Telegraph Company was incorporated with its $55,000,000 capital a few months ago in Trenton, N. J., it gave rise to a rumor that its ultimate object was to absorb all the telegraph and telephone companies doing business in the United States. This report gradually died a natural death, but has again recently been resurrected by the following brief statement, which appeared in the columns of one of our contemporaries a short time ago:

"There have been numerous rumors of late concerning the probable amalgamation of all the telephone and telegraph companies of the United States. These are the American Telephone & Telegraph Company (which now includes the American Bell Telephone Company), the Telephone, Telegraph & Cable Company of America, the Western Union Telegraph Company, and the Postal Telegraph Cable Company.

"It is predicted by those in position to know that these interests will be consolidated into one big company, to be known as the National Telephone & Telegraph Company, and that such consolidation will be accomplished before the end of the present century—which means before the end of the present year."

With a view to ascertaining whether there was any truth in this report a representative of ELECTRICITY called on Mr. William J. Latta, the well-known telephone financier and president of the Telephone, Telegraph & Cable Company of America. Mr. Latta, in reply to the questions put to him on the subject, stated most emphatically that he knew nothing about

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the rumored consolidation, that he had not authorized the use of his name in connection with the matter, and that it was generally thought that the rumor was being circulated for stockjobbing purposes.

Mr. William H. Baker, vice-president and general manager of the Postal Telegraph Company, referring to this same subject, said:

"You can deny, emphatically, that the Postal is contemplating any combination with the Western Union or with the Bell Telephone Company, or that control of the Postal or the Commercial Cable Company is for sale. Mr. Mackey has stated positively that these companies are not for sale, and that they will not be consolidated with any existing companies.

"This story is one which has gained currency at various times of late. Numerous reports have been printed regarding a consolidation of telephone and telegraph companies in the United States, but so far as I know they are all entirely without foundation. The present story is merely an elaboration of a story which was in circulation some time ago, and, like the original one, is without foundation."

The charter of the National Telephone & Telegraph Company is a sweeping one, and by its provisions permits it to "construct, maintain and operate electric telephone and cable lines within New Jersey and across the Hudson with lines in New York, now or to be established, connecting with lines at Trenton, connecting with lines in Pennsylvania, in New York and in other States, Territories and colonies and foreign countries." That this corporation which has back of it many well-known and wealthy men, means to form a consolidation of some nature is not to be doubted, but what companies it proposes to amalgamate it is impossible to say at the present time, and in view of this fact little credence should be given to vague rumors.

* * *

Physicians Discuss the Effects of Electric Light on Tuberculosis.

The meeting of the American Electro-Therapeutic Association, recently held at the Academy of Medicine in this city, was the means of bringing out considerable valuable information regarding the application of electricity and electric light for the cure of tuberculosis. The physicians present were all anxious to get at the facts of the matter in view of the amount of literature that had appeared of late descriptive of alleged electrical tuberculosis cures.

The effect of electric light on consumptive patients was gone into, and the statements made would seem to bear out Dr. J. Mount Bleyer's remarks on the subject made before the Medico-Legal Society and Congress of Tuberculosis in February last. On that occasion Dr. Bleyer among other things said:

"Arguing from all that I have said, and all that is known about the blue and violet rays in conjunction with the atmospheric conditions in general, I set out to make practical application of these colored rays of light as an adjunct to the treatment of tuberculosis, in their various stages of progress, as a prophylactic in supposed early stages, etc. Much to my satisfaction, the practical experiments which I have tested in so many different conditions in tuberculosis, these tests have all given good account of themselves in most instances, so that I am very happy to make you acquainted with my results, as I have found them. I am of the positive belief, from my acquired practical and theoretical knowledge of facts, that the best method to treat tuberculosis and other forms of lung diseases, is in specially designed solariums at home or at a sanitarium where violet lights can be generated according to the requirement of each individual case, and specially treated upon principles according to the condition of each case.

"From all the reports and researches of the present day by the expert men in this branch of study, we find but one cry, and but one concert of opinion for the successful treatment of tuberculosis—hygiene, food, sunlight!"

The above opinion apparently coincides with that of Dr. Wolff Freudenthal, who, at the recent Electro-Therapeutic Association Convention, said that experiments have shown that the effect of electric light on the human body is the same as sunlight, which has been valued for centuries for curative powers. Under the influence of electric light, he said, the body gives off in breathing more carbonic acid gas, and is stimulated to greater activity. The electric treatment, he asserted, is not only painless, but pleasant, and all of his patients have insisted upon its use.

Dr. Freudenthal declared that he expects to see the apparatus for the application of electric light in cases of tuberculosis perfected very soon, and that a great step will thus be taken toward the absolute cure of that disease.

Several other physicians in discussing the value of electric light in the treatment of tuberculosis agreed that its use had been followed by remarkable results.

It is to be hoped, judging from the optimistic views taken by the physicians at the meeting in question, that an electric, or light cure, will soon be found for this dread disease.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

Lieut.-Gen. Miles, in his annual report, will renew his recommendation for the use of the automobile in the army. There are now at Fort Myer, Va., three automobiles, but they have not been proved satisfactory for lack of facilities for recharging them with electricity.

Mr. Ralph B. Marchand, for some years expert for the Westinghouse Company in connection with the long distance transmission of electricity, has been appointed to a similar position with the Montreal Street Railway and the Chambly Manufacturing Company of Montreal.

An order from South Africa for electrical material has lately arrived and has been booked by an engineering firm in this city. The shipment, which is to be made to Cape Town, will aggregate some $20,000 worth.

It is proposed to erect an electric light plant at Simla, the summer capital of India. It is in the foothills of the Himalayas, and water-power is abundant. Kerosene is used at the present time.

What is said to be the largest electric crane ever built in the world has been finished by Pawling & Harnischfeger of Milwaukee, Wis., for the Midvale Steel Company of Philadelphia for use in the manufacture of armor plate for battleships. The giant crane can lift 200 tons, weighs 400,000 pounds and the cost of the piece of machinery will be $40,000. The electric crane required sixteen flat cars to transport it. The crane has a sixty-five foot span and it will be operated on a track fifty-six feet from the floor.

John D. Long, of Chicago, has invented a modern car fender. This fender is constantly under the control of the motorman and the object is to provide a receptical which is sufficiently raised to escape damage by striking any obstruction on the track. It is so connected with the brake mechanism that when the brakes are set the fender is thrown in position to scoop up any person on the tracks and further to provide a brake mechanism which will enable the brake and fender to be operated with great rapidity.

Consul Worman at Munich writes to the State Department saying that most factories in Germany have nothing like our electric timekeepers, and an effort to introduce them into Germany, especially into South Germany, where new enterprises are constantly being launched, ought to be successful.

The Harms Milling Company of Harms, Tenn., has now, in connection with its flour and saw-mill, an electric light plant, by which it runs both. The company contemplates furnishing lights not only for the mills, but to families in the locality, and if possible continuing the wire to Fayetteville, Tenn.

The Triumph Electric Company of Cincinnati, O., furnished the dynamos that drop the exhibit of the J. A. Fay & Egan Company at the Paris Exposition. They were not entered as any part of the exhibit though they naturally attracted some attention. A letter was recently received by the concern from the Paris Exposition officials, announcing that the dynamos of the Triumph Company had been awarded a medal.

A short time ago an infuriated bull was the cause of frightening thirty passengers on a Philadelphia and West Chester, Pa., trolley car. He had broken from a field and wandered along the trolley tracks. When the car came along he took up his stand between the rails, and refused to budge. Apparently the animal was incensed by the glare of the big electric headlight, and against this he bent all his energies. Backing away from the car, he charged with such fury that the car shook from end to end. This was repeated several times, and when the animal realized that he had met his match and wandered away, there were two big holes in the forward end of the car and the headlight was useless.

A story is current that hitherto the Sultan of Turkey has forbidden the importation of electrical appliances or their use by local manufacturers, on the ground that they were inventions of the evil spirit. About a month ago an American firm sent to Constantinople a consignment of electrical goods for introduction. The goods on arriving were confiscated by the Turkish customs officials. The American electrician who was sent with the goods appealed to the American Consul General, C. M. Dickinson, and after many efforts an audience was obtained with the Grand Vizier, and this official finally permitted the electrician to show how the electrical devices worked. A room in the Sultan's palace was turned over for the exhibition. The marvels of the "Wonder Room" soon spread all over the palace and the Sultan learned of them. Abdul's curiosity induced

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him to inspect the mysterious contrivances, and in a moment of enthusiasm he bought the entire lot of goods in the palace and gave orders that hereafter the introduction of similar articles into the Empire should be encouraged and fostered.

A German professor by the name of Rosen berg has invented a system of wireless telegraphy which he claims is an improvement over that brought out by Marconi. The professor's idea is to reduce the size of his transmitter and receiver so that it may be carried in one's pocket. This would enable a person, so it is claimed, to walk along the street or sit in his office and communicate with his home.

Although the development of the telephone in Russia may be somewhat slow as compared with other countries, still the growth of its telephone system is very considerable. According to some comparatively recent statistics, there were in Russia an aggregate of some 35,000 miles of telephone wires—about half State and half private concerns. The use of the telephone and the number of subscribers are, however, rapidly increasing, and some important lines between some of the larger cities are under contemplation or already completed. In the Baltic provinces there are some large telephone systems, but they do not appear to be altogether satisfactorily constructed, inasmuch as the different lines, which are frequently of considerable length, have no connection with each other. This is, says "Engineering," London, mainly attributable to Government restrictions where State telephones already exist.

A dispatch from Seattle, Wash., states that Gen. A. W. Greely, chief of the Army Signal Service, returned from Alaska on the steamship Ohio which arrived in port on September 28. The steamship Orizaba, engaged in laying a Government cable between Nome and St. Michael's, went aground on an unchartered reef near the latter place September 17. Gen. Greely was on board at the time, and says the vessel will be saved unless a sudden storm causes it to break up. The steamship Senator started at once from Nome to take off the crew and cargo including the Government cable. The laying of the cable will be postponed until next season. The Ohio brought 500 passengers.

The air ship designed by Count Zeppelin in Germany, and which was about to be given another trial, has met with an accident. The chains which supported the air ship broke a few days ago, with the result that the ponderous mass, weighing about nine tons, fell with a crash. Several ribs were badly bent, and will have to be replaced before a test of the ship's flying powers can be made.

Mr. Cowper-Coles, the electro-metallurgist, has worked out a system for drilling and slotting metals, principally iron, by means of electrolysis. A jet of an electrolyte, either dilute sulphuric acid or a solution of common salt, is caused to impinge on the plate or other object to be drilled. The plate or other object is made the anode of an electric circuit, the nozzle from which the jet flows forming the cathode, and a current of electricity being passed through from the plate to the nozzle. The plate is, says the "Colliery Guardian," London, worn away where the jet impinges on it, just as the anode, the silver or copper plate, is worn away in an electro-plating bath. The arrangement forms, in fact, an electrolytic bath, the containing vessel being the air surrounding the jet. As the apparatus in its simplest form is found not to drill or slot very accurately, the inventor has slightly modified it. In his later apparatus he has the nozzle brought right up against the plate, but separated from it by an india-rubber washer, which determines the size and shape of the hole. A small needle point also is arranged to form the negative electrode, the cathode, the powder from the hole or the slot collecting on it.

One of the most interesting features of the extension of the electric lines of the Bay Counties Power Company to Oakland, Cal., will be the cables suspended over the waters of Carquinez Straits. Tall steel towers are now being built and in a short time four cables will be hung from them, carrying a powerful electric current, which will be used on some of the street railway systems in Oakland. The main power station of the Bay Counties Power Company is situated in the canyon of the Yuba River, somewhat over 140 miles from Oakland, and men are now at work over the entire distance constructing the first of two lines. Each line consists of three wires, and it is necessary to construct two lines, so that in case of accident to one line the other may be used.

According to the London "Times" a novel machine gun has been invented by Mr. James Judge, an engineer at New Castle-on-Tyne. The gun is a patent centrifugal quick-firing machine gun; it is five feet high and weighs about five hundred weight. It is intended for battleship, earthworks and garrison purposes. The motive power is electricity transmitted to a motor attached to the side of the gun. The motor causes a disk to revolve at a very high rate of speed. The bullets, which are introduced into the interior of the disk at the axle, travel along curves in the interior to the circumference and are there impelled through a barrel. It is claimed that this disk will rotate, under the influence of the motor, at the rate of 12,000 revolutions per minute, and will eject shots from the muzzle of the gun with an initial velocity of 2,000 feet per second. One of the chief characteristics of the gun is that it will maintain a continuous fire. If necessary, a shot may be discharged at every half revolution, but in practice one shot every fourth revolution will be found sufficient. The bullets are spherical and measure 3-16 inch in diameter. The following are the results of the tests already made with the gun: 18,000 rounds of shots at the rate of 3,000 a minute have been discharged from the gun. These shots consisted of nickel, steel, some of brass (as used in France), lead and chilled metal.

Major T. B. Mott, U. S. A., who represented the United States at the recent French manœuvres, is reported as making the following statement on the utility of automobiles in the army: "The manœuvres proved extremely interesting and instructive. From several points of view the extensive use of auto-cars was a most striking innovation, and the results attained have fully justified the claim for their practical utility in European warfare. They did excellent work, enabling the generals and their messengers to cover great distances in a few hours. Auto-traction cars, moreover, immensely facilitated the work of the commissariat department, each drawing six or seven cars heavily laden with provisions. They have undoubtedly come to stay. I examined this question of military automobiles, however, from the American standpoint, and, while fully appreciating the enormous service they render to the armies of Europe, where the highways are level and well built, and the distances comparatively small, I do not believe they would be of sufficient value on the rough American roads and over enormous tracts of country as in the United States, to justify the heavy expense of their introduction and maintenance in the American army."

In 1894 the Caborundum Company at Niagara Falls commenced the manufacture of carborundum on a really commercial scale by the use of an electrical current of 150 horse-power, which gave a production of 100,000 lbs. of carborundum per year; in 1895 the company built its factory at Niagara Falls, and 1896 commenced the use of 1,000 electrical horse-power. In 1899 this was increased to 2,000 horse-power, the production of carborundum for that year amounted to 1,742,000 lbs. On January 1, 1900, the company had in operation fourteen furnaces. The scale and the character of the sale of carborundum has changed from a measurement by the carat at $600 per lb. in 1892 to the measurement by the carload at 10 cents per lb. in 1899. The total sales of carborundum in 1899 amounted, to 2,018,000 lbs., says the "Mining and Scientific Press." Besides the varied and commercial uses of carborundum, it is now becoming of interest to metallurgists in other fields, notably in its substitution for ferrosilicon in steel manufacture.

It is stated in the French press that a proposition by the Société Electrotechnique of Vienna, Austria, to hold an electrical exhibition in that town in 1903 has been received with great favor. Committees are already being formed, and numerous inquiries have been made as to the details of the exhibition. Everything apparently is to be done to make it a success, and the work of organization has already commenced.

A new arrangement has been inaugurated in connection with the Berlin telephone service, by means of which a subscriber can obtain a time signal every morning at nine o'clock. Subscribers wishing to receive the benefits of this system must pay an extra subsription of $2.50 per annum, and must see that their telephone is not in use at about the time the signal is expected. The signal is given to all subscribers precisely at nine o'clock by their bells ringing, and continuing to do so for about one minute.

Figures compiled by the Treasury Department give an excellent idea of the extent to which American electrical manufacturers are invading the foreign markets. During the eight months ending August of the present year, the exports of electrical machinery reached the enormous valuation of $3,590,419 as against a value of $1,828,048 for the same period of last year. The value of the exports of instruments and apparatus for scientific purposes, including telegraph, telephone and other electric apparatus, increased from $3,610,966 during the eight months of 1899 to $4,171,561 for the same period of 1900.

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STORAGE BATTERY—ITS USE ON SMALL ROADS.*

BY B. B. VAN NOSTRAND.

The application of storage batteries to the generating system of large electric roads has been described by many engineers in a variety of ways, so that an impression has been left upon many minds that it is only with these larger systems that the battery scheme is feasible. This idea is incorrect, and I think that the following description of the equipment and operation of the Peekskill Lighting and Railroad Company will bear me out in the statement. In the description of this road we shall see conditions that apply in a general way to most small lines.

This road was placed in operation in June, 1899, since which time it has been running without any interruption except momentary stops caused by the circuit breakers flying out. Beginning at the station of the New York Central Railroad, which is at the western edge of the town, near the Hudson River, the road proceeds in a practically straight line through the center of the town and on to Lake Mohegan —a total distance of 4½ miles. The road is an exceptionally hilly one, in fact the fairly level portions are the exception, and are never more than 1,600 feet long. Beginning at the New York station terminus, the road, as far as grades are concerned, is about as follows: Starting into town, there is 1,000 feet of 7½ per cent. grade—with a small portion (say 20 feet), where it reaches 9 per cent. For a distance of about 4,000 feet beyond this, there is a gradual grade, varying from 5½ per cent to 2 per cent. terminated by 300 feet, of 5½ per cent. to 7½ per cent. At the top of this is a short level, leading into a 2,000 feet 2 per cent. incline, followed by 1,600 feet, varying from 4½ per cent. to 8½ per cent., which is in turn followed by 2,000 feet of 3½ per cent. up-grade. There is after this a depression, represented by 1,400 feet of down-grade, varying from 6.8 per cent. to nothing, which, after passing into a short level rises by 1,400 feet up-grade with a maximum of 4.6 per cent., to another short level. Then follows another down-grade of about 1,800 feet, varying between 8 per cent. and 2 per cent. This is followed by 1,600 feet of level—terminated by 300 feet of 8 per cent. After this is 1,000 feet of level, passing into a short down-grade of 6 per cent., 1,300 feet of level is after this, passing into 2,000 feet of 7½ per cent. The final portion to the end of the road is about 800 feet level.

This entire line of single track, with four turnouts, 56-lb. T-rails are used throughout, these being laid in the usual manner.

There is a single-track branch 4,000 feet long extending from the New York Central station north to the State Camp Ferry. This operates but one month of the year, at which time two cars are in service.

The overhead construction of the system is simple—consisting of 00 trolley throughout, with 0000 feeder, extending to within ½ mile of the lake end and 1,000 feet from the station end. The branch has no feeder. The 0000 feeder is tapped at regular distances throughout its length.

The apparatus for operating the road consists of one 60-kw Edison bipolar 575-volt, 880 r.p.m. generator, belted to a horizontal 13-in. x 12-in. Armington & Sims simple engine, the horse-power of which is about 100, at 275 r.p.m. Belted to this same engine, in tandem with the dynamo, is a four pole differential booster, which is used to render the charging and discharging of the battery automatic.

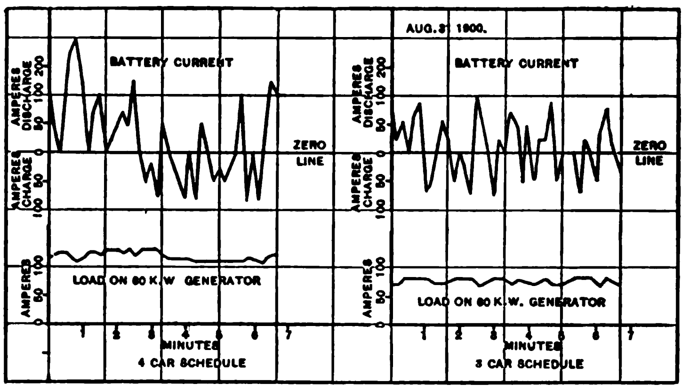
There is another unit consisting of a Westinghouse 120 kw, multipolar 625 r. p. m. generator, belted to a vertical 14 in. and 24 in. x 14 in. Westinghouse compound engine of 200 hp. capacity. It may be added here that this generator is rarely used, and that only when the road is unusually heavy—such as occur on holidays and warm Sunday afternoons. The same engine which operates this generator is also belted to one of the alternators for incandescent lighting. It may be well to note that in addition to the above engines there are three other engines which operate the remaining light machines. These, of course, have nothing to do with the railway system. In the boiler room are three 80 hp. and 100 hp. horizontal return tubular boilers, carrying steam at 105 lbs. pressure. During the summer months two of the 80 hp. boilers are sufficient to run the entire plant—though three become necessary in winter.

The battery, which is in the simple wooden shed next the boiler room, consists of 262 type F-9 chloride accumulator cells. Each cell is comprised of nine plates, 10½ ins. square, suspended in glass jars of sufficient size to enable the capacity to be increased in future by the addition of more plates. Each cell is mounted upon a wooden tray, filled with sand, to ensure an even foundation for the jar. These trays rest in turn upon glass insulators, supported by a wooden battery rack. On full charge the battery has a maximum rated capacity of 160 amperes for short periods. As a matter of fact, however, it is often called upon to discharge at a considerably higher rate than this, 250 amperes being called for momentarily.

During the summer season three cars are run from 6 A.M. to 12 M. Two of these run through Peekskill as far as the car house at the eastern edge of the town. The other car runs through the town and on to Lake Mohegan. This gives a twelve-minute schedule in town, and forty-eight minutes through to the lake. In the afternoon and evening four cars are run, giving a twelve minute schedule in town, and twenty-four minutes through to the lake. On holidays, etc., five cars are run, all going through—thus maintaining a twelve-minute schedule throughout the run.

Having gained a fair idea of the nature of the system, we will pass to the results obtained in the station.

The point of first importance is the remarkable constancy of the load upon the generator, and the correlated fact that the 60-kw machine is all that is necessary to operate the road, except when running the five-car schedule. The curve marked No. 1, in the engraving, will explain this. This shows the results of ten-second readings, taken upon the battery and generator during a short portion of a four-car run. The total line current is, of course, the summation of these two. It is seen that this total current fluctuates between 25 amps. and 310 amps., and that the generator runs along at practically full and constant load—the battery assuming the fluctuations above and below this. Curve No. 2 shows the same results for a three-car run. Here the average or generator load is lower (about 75 amps.), and the line fluctuations from 0 amps. to 170 amps. The practical good of this is evident. It means that a 60-kw. machine is running instead of 180 kw., which would be required were the battery not in service. In other words, although



No. 1. No. 2.

the load fluctuates from almost nothing to 180 kw., the average is in the neighborhood of 60 kw., and it is this average only which falls upon the generator and engine. The remarkable evenness of the load upon the generator produced by the operation of a storage battery is shown very nicely by the fact that we are operating our 120-kw. railway machine and one of the alternators for our electric lights from the same engine. Ordinarily this would produce a very serious flickering in the lights, but in our case it is impossible to detect the slightest change in the brilliancy of the lamps, although the railway may be fluctuating between its widest limits. I have not had an opportunity to test the coal saving produced by this arrangement, but I am confident from my observations that it is sufficient to pay a good return upon the battery investment over and above the interest and depreciation charges.

The increased economy of a small unit operating at a full and constant load above that of one three times the size, but doing the same work under highly fluctuating conditions, is such as to warrant this assumption.

It would be difficult to increase the simplicity of operation in this plant. After the original adjustment, the apparatus has worked together without the slightest difficulty. We have a generating unit operating under electric lighting conditions, due to the fact that the battery removes from the systems all sudden overloads, and the strain thus removed from the minds of those in charge is in its effect almost as valuable as this latter consideration.

In other ways the battery is valuable. A great many times it has been necessary to shut down the small engine suddenly from some mishap. During the eight or ten minutes neces-

*Paper read before the New York State Street Railway Association, held at Buffalo, Sept. 18, 1900.

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sary to get the other unit into operation the battery has carried the entire load.

Then, too, it is often desirable to run a car for some special occasion very late at night. At such times the generator is shut down and the battery thrown across the line.

In conclusion, I may state that the battery has given us absolutely no trouble since its installation, and the daily labor for its proper care does not average more than one-half hour. In fact, about all the work required is that of taking voltmeter and hydrometer readings upon the individual cells once each week.

THE BRITISH ASSOCIATION.

[The following are abstracts of papers read at the meeting of the British Association for the Advancement of Science held at Bradford, Eng., Sept. 8, 1900.—Ed.]

WIRELESS TELEPHONY.

BY SIR WILLIAM HENRY PREECE, K.C.B.

The first experiments in this direction were made in the month of February, 1894, across Loch Ness, in the Highlands. On that occasion trials were made to determine the laws governing the transmission of Morse signals by my electro-magnetic method of wireless telegraphy, which has formed the subject of frequent reports to this section since 1884. Two parallel wires well earthed were taken, one on each side of the lake, and arrangements were made by means of which the wires could be systematically shortened, with a view of ascertaining the minimum length necessary to record satisfactory signals. It occurred to Mr. Gavey, who was experimenting, to compare telephonic with telegraphic signals, i. e, to ascertain whether articulate speech could be maintained under the same conditions as Morse signaling. The trials showed that it was then possible to exchange speech across the loch at an average distance of 1¼ miles between the parallel wires, when the length of the wires themselves was reduced to four miles on each side of the water.

What led to this train of thought was the fact that, although the volume of a telegraphic current was immensely greater than that of a telephonic current, whenever through want of balance in a loop disturbance was evident, then telephonic cross talk was also manifest. In other words a weak telephonic current was apparently as powerful a disturber as a strong telegraphic one.

The sensation created in 1897 by Mr. Marconi's application of Hertzian waves, distracted attention from the more practical, simpler and older method. Mr. Evershed and Prof. Oliver Lodge had in the meantime much advanced the system by introducing admirable call systems.

In 1899, I conducted some careful experiments on the Menai Straits, which determined the fact that the maximum effects are produced when the parallel wires are terminated by earth plates in the sea itself. It became quite evident that the ordinary inductive effects are much enhanced by conductive effects through the water, and that in consequence shorter wires are practical. No special apparatus seems necessary. The ordinary telephonic transmitters and receivers were used.

It became desirable to establish communication between the islands or rocks known as the Skerries, and the mainland of Anglesey, and it was determined to do this by means of wireless telephony. The lighthouse at the Skerries was wanted to be in communication with the coast-guard station at Cemlyn, which is connected with the Postoffice system, The bottom of the Channel is too rough, and the currents too violent for a cable. A wire 750 yards in length was therefore erected along the Skerries, and on the mainland one of 3¼ miles from a point opposite the Skerries to Cemlyn. Each line terminates by an earth-plate in the sea. The average distance between the parallel portions of the two wires is 2.8 miles. Telephonic communication is readily maintained and the service is a good one. Lodge's call system will be used.

No experiments have yet been made with ships, but it would appear simple to speak by telephone between ship and ship, or between ship and shore, to considerable distances across space by means of a circuit formed of copper wire terminating at each end of the ship in the sea, passing over the topmast and using simple telephones.

MANCHESTER AND LIVERPOOL RAILWAY—BRAKES AND SIGNALS.

BY F. J. BEHR.

Brakes and signals are so intimately connected that the one cannot be treated separately from the other.

The most perfect condition under which a railway could be worked, would be that in which both brakes and signals could be dispensed with, therefore it follows that the fewer the occasions for using either, the better.

Now as to brakes, there is a limitation of their application, which, demands not so much on the mechanical appliances themselves as on the endurance of the human bodies in the trains. It was stated by an eminent railway official that with the Westinghouse brake, a train traveling at 60 miles an hour could be stopped, as an emergency brake, within 360 yards without inflicting too great a shock on the passengers. In the same way, a train traveling at 110 miles an hour could be stopped within 500 yards, and probably in a shorter distance, as in the latter case electrical means are at hand, such as the reversal of the motors, so as to turn them into dynamos. More rapid stoppage could only be made with great discomfort to the passengers. Now in the ordinary way of working our railways at present, there are many occasions in which it might be important to stop the train as rapidly as possible. For instance, if a train in front should be seen, or some shunting operations were not completed, or others too many to enumerate, but no brake, however powerful would be of the slightest use to day to avoid a sudden obstacle, such as a stone placed on the rail or a broken rail, for it is impossible for the driver to be aware of such obstacles until he is practically upon them. For these cases of great emergency, therefore, the stoppage at 300, or 200 or even 100 yards is quite useless.

What I wish to show now is that on the proposed high-speed electrical railways, though it is quite possible to brake the train within less than 500 yards, it never can be necessary to bring it to a standstill at even a much longer distance.

On the proposed railway there are no level crossings, no switches, no shunting operations, and in fact nothing that will require the train to be brought to a standstill, except in the event that a preceding train should break down. Besides this one case, the brakes can only be used for stopping as you approach the stations. A broken rail offers no danger in this case whatever, for the train would run over it without any danger or difficulty. This can easily be shown by carefully considering the relative position of the wheels in the carriages to the rails over which they travel.

I now, therefore, have only to explain the manner in which it is arranged that the driver of each train shall be informed of the possible stoppage of the train in front of him.

No second train will leave the station at Manchester or Liverpool until the first has reached Warrington, a distance of just 17 miles.

We subdivide the line for the purpose of signaling into eight sections of 4.3 miles each. As trains leave Manchester station a danger signal is put up automatically at that station, a second similar danger signal is put up in the same way at 4.3 miles off, the first remaining at danger. The train travels on until it reaches 8.6 miles, when it puts up a third danger signal, and simultaneously the signal is lowered at Manchester or Liverpool station, so that the second train can leave when the time comes.

Now, we will assume that the first train has met with an accident after passing point 8.6 miles, the second train would travel at a higher speed right on, but when it passes point 4.3 miles, the danger signal at that point not having been removed by the first train, as this never reached point 13 miles, the driver of the second train would be informed that the first train had met with an accident beyond 8.6 miles and threfore that he had to slow down, but that for such lowering of his speed he had a clear run of over four miles. Therefore, there could be no difficulty in any case to stop even without using the brake at all, by simply cutting off the current.

Whenever a train passes over a point where the danger signal is put up this is also produced, either electrically or mechanically, by a very simple and inexpensive contrivance in the cabin of the electrician, so that he should be perfectly able to see it without difficulty even if there was a thick fog

Under these conditions of traveling it seems, therefore, superfluous to have any emergency brakes, and though we shall be able to stop the trains within 500 yards, no case can be imagined in which it would be useful or necessary to resort to such a stoppage.

A six minutes' service of trains can be established without any alteration in the proposed arrangement, and if a three minutes' service was required, the blocks would have to be reduced to two mile sections giving a clear run of two miles in case of a breakdown.

A COMBINATION INTEGRATING WATTMETER AND MAXIMUM DEMAND INDICATOR.

BY T. BARKER.

The paper fully sets forth the advantages of the maximum demand system of charging for the supply of electricity, and describes a new meter—the invention of Messrs. Barker and Ewing—to be used for this purpose. The paper was illustrated by diagrams, and examples of the meter were exhibited.

In charging for the supply of electricity it has become usual to make a distinction in the prices charged to those consumers who use a few lights for many hours per day, and those who use many lights for an hour or less, for, although at the end of the year the number of

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units consumed may be the same in both cases, the cost to the company or corporation in machinery, mains, and every other charge will be in the ratio of the number of lamps lighted at one time. The consumer who uses a few lamps for many hours should be charged at a less rate per unit in view of the smaller capital expenditure which his supply involves.

The late Dr. Hopkinson advocated a system which takes account of this consideration in arriving at the fair price to be charged for current. In the system in question, now known as the "Maximum Demand System," the total quantity of electricity consumed in six months is measured in the usual way, and the greatest rate at which the consumer has been taking current is also recorded. If the consumer in the six months' period takes a smaller total than would correspond to one hour a day at the greatest rate of demand he is charged the full price per unit, but if the total consumption exceeds this he is charged a reduced rate for each unit in excess.

The system has been used with marked success in some seventy-two towns. It has improved the load factor, and has enabled a large number of additional units to be sold without increase of station plant or mains. Until the introduction of Barker and Ewing's demand indicator it was necessary to use two meters —one to record the total number of units taken by the consumer and the other to show his maximum rate of demand.

The Barker and Ewing indicator forms an integral part of the ordinary meter, and absorbs no energy; it further records watts and not amperes. With an alternating supply it shows actual watts and not apparent watts, an important difference in the case of motors and arc-lamps. It is not affected by any ordinary short circuit, its time lag being sufficient to prevent it coming into action. The indicator may be used to show the actual rate of demand at any instant in place of recording the maximum rate of demand. In this form it is specially useful in switchboard instruments, showing the attendant the rate at which electric energy is passing through a feeder or is supplied from a dynamo at any instant. The meter also serves at the same time to integrate the total amount which has passed through that particular feeder or machine.

A Swiss Power Transmission Scheme.

A recent issue of the "Schweizerischen Bauzeitung" describes an interesting scheme for supplying Lausanne, Switzerland, with electric current for lighting and power purposes. The most noteworthy feature in connection with the undertaking is that the energy will be transmitted in the form of high-pressure continuous current over a distance of 56 km., and afterwards distributed in the form of three-phase current to consumers in Lausanne. The generating station will be situated near St. Maurice, in the upper valley of the Rhone. At the point selected the available fall of water varies between 34.5m. and 36m., which yields a minimum of 6,000 hp. while during 10 full months of the year 14,000 hp. may be obtained. The initial installment of plant will comprise five turbines with horizontal shafts, each capable of developing 1,000 effective horse-power when running at 300 revolutions per minute. The constant current generated will be conveyed by means of two bare conductors of each 150 mm. square sectional area to Lausanne.

MISTAKES IN THE RATING OF INCANDESCENT LAMPS.*

BY ARTHUR J. ROWLAND.

A 16 candle-power lamp is such a common article of commerce and in such general use that we all recognize it when we see it, or think we do, either by the size of its bulb or the length of the filament, or both. Very few people go beyond such mechanical identification except for the extra assurance they gain by a look at the manufacturer's label. Some, indeed, presume to tell that a lamp is of a given candle-power by looking at the brightness of its filament or by considering the general lighting of a room; but it need scarcely be said that an estimate formed by such a method is utterly worthless, since one is too much influenced by contrasts in brightness, or deceived by the temperature at which a given filament is burned, to really tell anything at all about the candle-power.

The importance of exact knowledge of the candle-power of incandescent lamps is at last being recognized among lamp users generally, One of the signs of this in the present times is the great number of photometers recently set up and used outside of laboratories. Certain standard measurements are made with these, which are good so far as they go, but commonly many important things are quite passed by unnoticed. Not only should the user of incandescent lamps want to know that the lamps he buys really have the candle-power marked on them, and that they maintain their candle-power properly as they grow old in service, but he ought to know and fully understand a number of other things regarding the real candle-power and watts per candle-power of the lamps he uses. Some of these seem to have quite escaped notice, and their importance is so great as to merit careful consideration.

WHAT A 16 CANDLE-POWER LAMP OUGHT TO BE.

Let us first inquire into just what a 16 candle-power lamp ought to be. That it should be one which gives a light equal to that of 16 candles in the direction in which the light is useful seems a natural and fair definition. A little careful observation of lamps as they are installed shows that at least 85 to 90 per cent. of those used are put in place with base upward, or tipped end downward, and it is the light which comes from this tipped end of the lamp which is useful. In cases where the lamp is installed in a different position, either the lamp is subordinated to some artistic feature of the electrolier, or the lamp is installed "side on" to better keep it out of the way. So it comes that the light we ought really to want to know about, the light we ought to measure, is that coming out of the end of the lamp. Or at least it is sure that, if we call the axis of the lamp a line through it from the middle of the base up to the sealed-off tip, the light of value is that coming into space below a plane perpendicular to the axis, half way along its length. We can never use more light than this, since for satisfactory lighting the sources must be above us, and in real service we make use of much less, as will be presently shown. Should we take the average candle-power of all the light rays into space below the imaginary plane just defined, this would be called the mean hemispherical candle-power, just as the average candle-power of all the light rays given by the lamp in every direction is called the mean spherical candle-power.

THE IMPORTANCE OF THE LIGHT FROM THE TIPPED END.

The placing of lights is to-day being made much more intelligently than by the old rules of so many 16 candle-power lamps per 100 square feet of floor surface, or per 100 cubic feet of room to be lighted. Some certain amount of illumination is now striven for, and a proper distribution of light rather than of lights is sought.

In a great deal of lighting one tries intentionally to give illumination concentrated about particular points. For example, in lighting a library it is the library table which is to be brightly lighted; other parts of the room need little more than the scattered rays otherwise useless, which reach them directly from the light source or after reflection. The light rays in poor planes and the reflected light which comes from the table, the walls and objects in the room, though contributing little to the important light, serve to break up shadows and produce diffusion. Almost the same thing would be true of the lighting of a bedroom, where the light should be concentrated about the bureau or dressing table.

In quite a different sort of lighting, still the same things hold true. Take the lighting of a factory or mill for example. The light must be on the machines or work, and be very good there. That which gives the room its general lighting is waste light from the light sources. To light the whole room as brightly as the machines would be too costly to be practical. For such lighting let us consider what rays are useful and what rays waste light. If the lamp hangs directly above the thing to be lighted, and its area be not more than 5 x 5 feet, no rays of light beyond 30° from the axis of the lamp will be useful, and the higher the lamp is hung, the less the angle in which the useful light is found.

A second sort of lighting is that in which a uniform distribution of light is required, as in concert halls. or auditoriums of various sorts, and in shops for the sale of merchandise. A fundamental principle in this class of lighting is to use many sources of small candle-power each, all so placed that the light from them is directed downward, with perhaps a little diffused side light to break up the shadows, especially in small interiors. The lighting engineer is forced to use single lamps to procure this, except in large rooms, and they are nearly always installed base upward. The light from the tipped end produces the light of value.

A third sort of lighting is for decorative purposes, but that is so very especial and foreign to considerations of candle-power at all in most instances as to merit no consideration here.

The light below the lamp—that from the tipped end—is then the important and useful light in all practical cases. This is true, too, not only from the specific cases cited, but where large electroliers with many lights are used as well; for in such cases the lamps are usually flared out, with axes at some angle approaching 45°, in which case high candle-power from the tipped end and low from the sides of the lamp would contribute to a good even illumination of the room.

The importance of procuring high candle-power below the lamp has been recognized a long time. But what expensive and roundabout methods have been taken to procure it! It is very common to use reflectors to increase

* Paper read at a meeting of the Franklin Institute, Philadelphia, Pa., September 19, 1900.

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the amount of light in the direction below the lamps. While reflectors have their place in lighting, and an important one, too, for most purposes they are exceedingly poor and are used in ignorance of the effects they produce, or because no better device for light distribution can be had. No matter whether the reflector covers the lamp or not, no matter whether it is of porcelain, a glass mirror, or a polished metal surface, it inevitably cuts the light off absolutely in some directions and so directs it in others as to produce sharp shadows and brilliant lighting contrasts. In satisfactory lighting contrasts of light and shade are always avoided, and by producing diffusion most shadows are lost. Other devices, like McCreary shades and specially shaped incandescent lamps having a reflector incorporated with the lamp, have faults precisely the same as reflectors. Holophanes, with their prismatic and accurately formed surfaces, turn the light downward and at the same time diffuse it by refraction, so that on all artificial lights the distribution of the light and the lighting therefore is improved by their use. A holophane gives a redistribution of light immeasurably better than a reflector always. If an incandescent lamp is installed base down, holophanes or reflectors must be used on it or the lamp be valueless in supplying really useful light.

The common use of such devices is evidence that the ordinary incandescent lamp does not give as much light below it as is required there. Is there, then, a bad light distribution from them? An examination of modern lamps will tell us.

FILAMENT TYPES AND CANDLE-POWER DISTRIBUTION.

There are five different types of filament in use to-day by various prominent lamp manufacturers, and in most cases a filament type indicates the product of a certain manufacturer who has adopted that as the one used in his standard lamps. These typical filaments are enough different from each other to show interesting individuality. I have classed them as follows:

(a) Straight U-shaped filament; a type rapidly passing altogether out of use.

(b) Single curl filament; a type much used, having a circular loop in the filament midway of its length. This type was originally designed to render filaments stiffer and less liable to bend without an anchor, and also to shorten the lamp bulb. It was found to give a better distribution of light than type a.

(c) Long curl anchored filament; a type differing from type b in that the loop is long in the direction of the lamp axis and is anchored to the part of the lamp where the leading-in wires pass through the glass.

(d) Double filament; a type which uses two filaments like type a, set so the current passes through them in series, the filaments being in planes approximately parallel.

(e) Double coil filament; a type like b, except that there are two turns in the coil instead of one.

Besides being typical in the matter of general form, the light distribution observed from these various filaments is also typical. It is, however, considerably influenced by the exact relation of different dimensions in the filament itself used by particular firms; as, for example, the diameter of a coil or the spread of the filament shanks. Results below are therefore departed from somewhat if different makes of lamps had been used in the tests.

Fig. 1 shows average candle-power values from lamps of each of the different types. The arrows indicate the direction from which the candle-power was measured and the number gives the candle-power. These values are true averages of the types shown. In the averages struck no "freak" lamps were included. The five types are each represented by the product of some prominent lamp-maker. All the lamps are rated 16 candle-power, all were in the standard bulb used by the manufacturer of a type, and, as it happened, all were 3.5 watt 110-volt lamps. A careful inspection of the figure shows one that the form of filament has a most important relation to the candle-power distribution, as of course it must since the candle-power delivered in a given direction is determined almost wholly by the amount of filament length visible from that direction. A filament of type a shows only the end of the U when one looks in at the tip, and so the candle-power must be low, even if the U be broad. A double filament must show low candle-power for the same reason; and if the filament loops are narrow and the legs of the filaments straight, as they were in the lamps of the make tested, the candle-power may be even lower out from the tipped end than for a filament of type a. A filament with a coil in it shows much more projected length when viewed from the lamp's end, and so gives comparatively high candle-power in that direction. We see, then, that a 16 candle-power lamp is very different in the candle-power it gives in various directions and very different in a given direction with difference in type of filament. That lamp which gives most useful light is undoubtedly the best. Hence there is no question but that the 16 candle-power lamp with filament of type e is a far better lamp for general lighting purposes than any other. It is almost beyond belief that this has escaped notice in all the years incandescent lamps have been made and used, and yet it has been so. I first had my own attention called to the matter by the Shelby Electric Company, for whom I was making some tests of candle-power. It is their lamps which show as type e. In an attempt to find whether in the past any one had attached importance to the light coming out from the tipped end, I have been surprised to note how, over and over this or that experimenter or lamp manufacturer has been on the verge of the discovery and then passed it by. One of the most recent cases I have noticed is that of a lamp manufacturer who advertised sign lamps with "all the light from the end," but seems never to have thought that this would be the right sort of lamp to use as his standard product.

Fig. 2 gives the relative amount of useful light from filaments of the different sorts, expressed in per cent. of the light given by the double coil filament (type e).

The Shelby lamp (type e) for which data is given was made tipless; that is, the sealing off after exhaustion was not done as usual at the tipped end. The gain in candle-power by omitting the tip, so far as tests which I have been able to make indicate, is about 12 per cent. The loss in tipped lamps is probably due to light absorbed through the thicker glass at the tip and partly to reflection and refraction of light into useless directions which otherwise might have been saved to be useful.

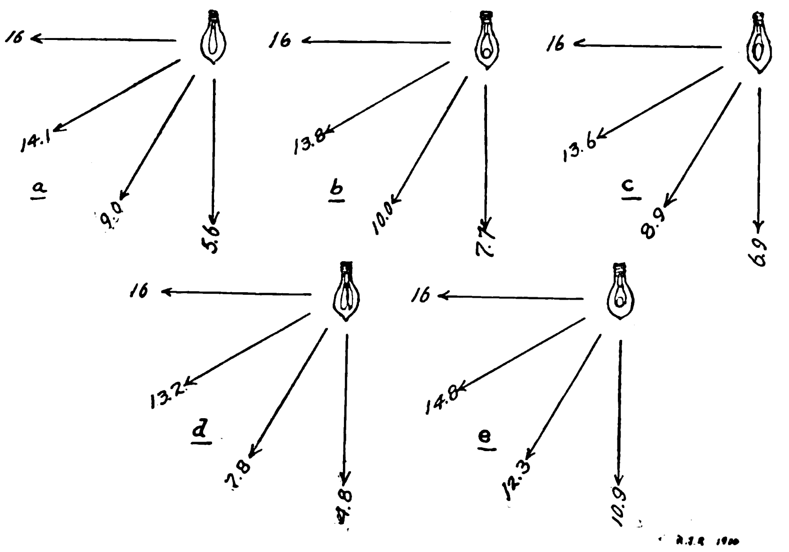

Fig. 1.

(a) Straight U-shaped filament.
(b) Single curl filament.
(c) Long coil anchored filament.
(d) Double filament.
(e) Double coil filament.

Showing average candle-power distribution from incandescent lamps of various types.

What folly it turns out to be to use special devices to turn the light downward when the lamp itself can have the filament constructed so as to give a proper light distribution. A design of filament for incandescent lamps so they will give large candle-power from the tipped end is second in importance only to satisfactory efficiency and maintained candle-power with fair average life.

Filament.	Light in Given Direction in Per Cent.	
	Vertically Downward	30° from Vertical.
Type e	100	100
" d	44.0	63.4
" c	63.7	72.4
" b	70.6	81.3
" a	51.4	73.2

Fig. 2.

ILLUMINATION BY LAMPS USING FILAMENTS OF DIFFERENT TYPES.

A large amount of light streaming from the end of the lamp is only useful if it produces a

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proper illumination. In Fig. 3 is plotted the illumination of a level surface 5 feet below a 16 candle-power lamp of different makes, the distribution being shown one way out from the lamp only. A single representative lamp was taken of each of three important sorts and the candle-power as marked on the diagrams determined for the light given in each of the directions shown by the arrows. The illumination was then calculated in candle-feet, and this plotted vertically from the base line. The solid curved line bounding the shaded area runs through the points so found, and all vertical distances from the base line give the amount of illumination there. Some of the values found are marked. Thus, for the long curl

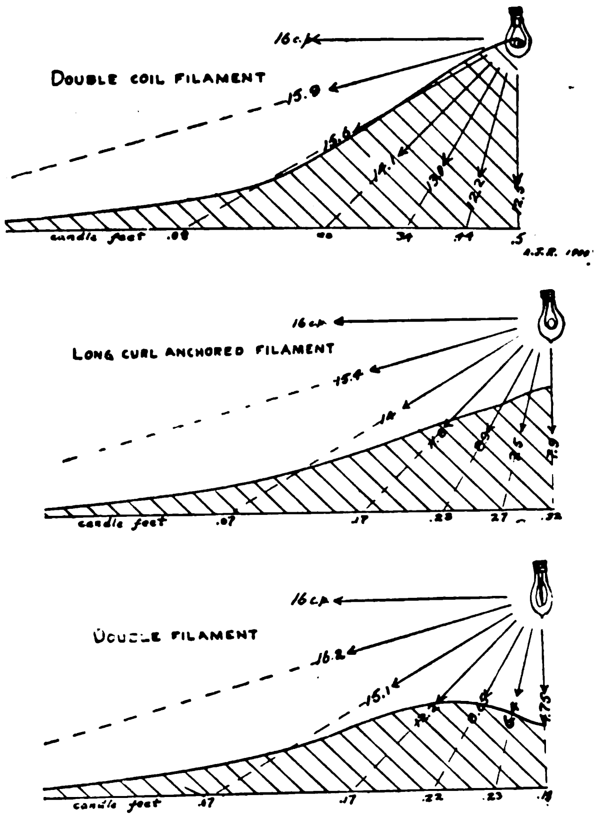

FIG. 3.
Illumination by filaments of different types.

anchored filament .32 of a candle-foot is procured at the surface illuminated by the ray giving 7.9 candle-power, .27 by the ray giving 7.5 candle-power, etc. The candle-foot unit is the common one; that is, an illumination of 1 candle-foot is that of a surface everywhere 1 foot distant from a light giving 1 candle-power in every direction. A surface 2 feet distant at every point from such a light source would have an illumination of ¼ of a candle-foot.

A first look at the diagrams would seem to indicate that the double filament lamp is best, since it gives more uniform illumination than either of the others. In any case, we need not concern ourselves with the light received from rays making an angle greater than 45° with the vertical; since up to this angle a circular area 10 feet in diameter, above the center of which the lamp hangs, is being lighted. Under the lamp the light is most valuable, and there we want to get most light. The double coil filament turns out, then, to be by far the best form. If in lighting an interior the lamps were hung separately and placed about 6 feet apart, the evenness of the illumination produced would be about the same for lamps having double coil filaments, or lamps having long curl anchored filaments; but the amount of illumination procured from double coil filaments would be so much greater that they are much to be preferred. We are assuming all along that 16 candle-power lamps, as the manufacturers call them, are in use. If lamps were placed 15 feet apart, the distribution of light with double filament lamps would be very good if an even distribution is desired; but the average illumination would be low.

It is interesting to notice, in these plots of illumination, that after the 45° ray is passed the value of all types of filaments is about the same; and it should be noted that the illumination procured is very small. An illumination of 1-10th of a candle-foot, for example, is that which one receives on a piece of paper held vertically more than 3 feet from an ordinary candle. Such light as passes out from a lamp most. Take a room in which the ceiling is only 12 feet high, in which a 16 candle-power lamp hangs 4 feet from the ceiling, and one finds that no rays from any lamp now made, passing out to reach the ceiling or wall above the horizontal plane through the lamp, will give an illumination of as much as .05 candle-feet on a surface 5 feet below the lamp, even on the assumption that the ceiling and wall are the best possible reflectors.

INFLUENCE OF FILAMENT FORM ON CANDLE-POWER.

A number of interesting matters connected with the distribution of light from lamps having filaments of the different types are shown in Figs. 4 to 8, inclusive. Each figure gives

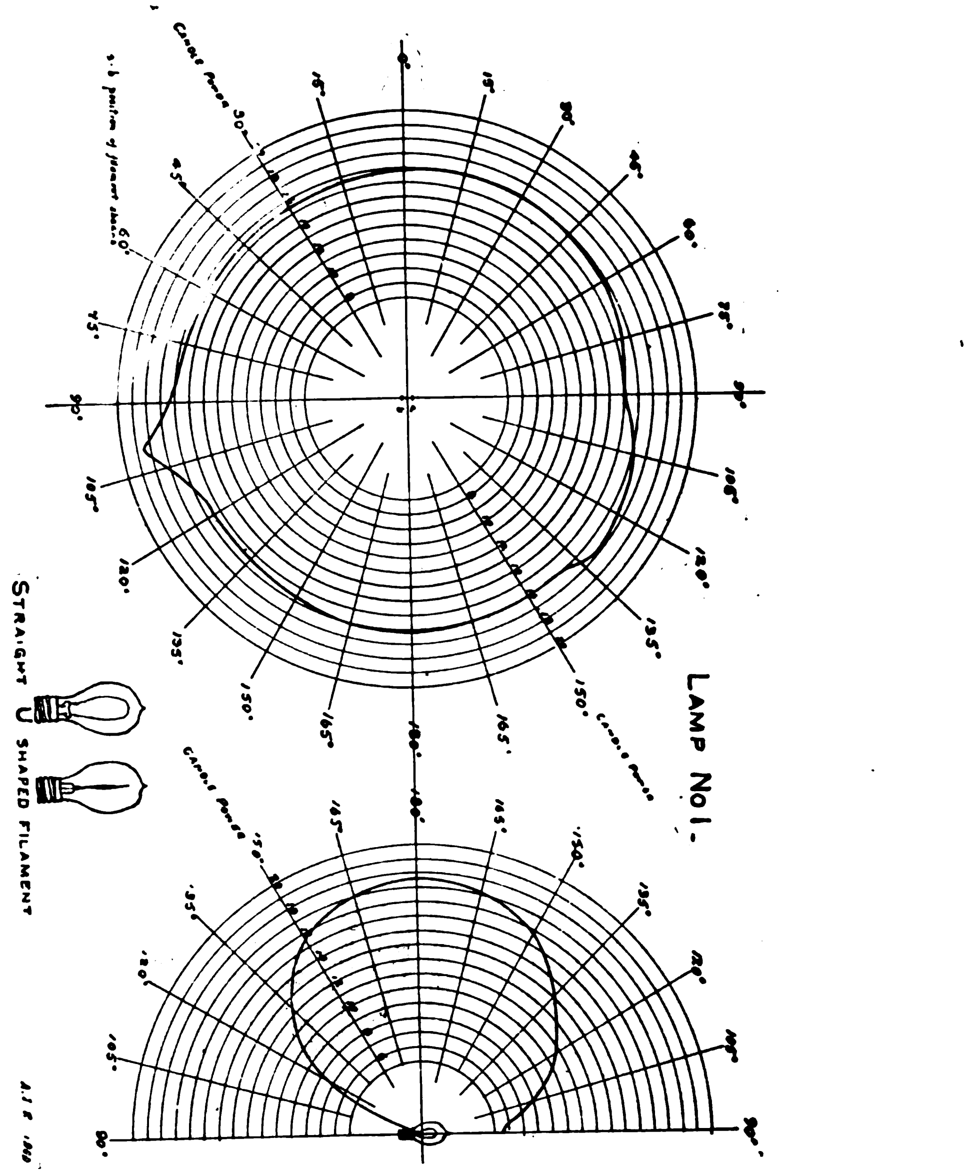

FIG. 4.

in directions nearly horizontal or above the horizontal plane is useless except it is reflected back to the surfaces to be lighted or contributes to the general illumination by dispelling the gloom of the upper parts of a room and by giving a diffused character to the light. While it has such value, it is rarely that one can afford to use much light this way. If light is useful after reflection, it must travel in long paths: so that even if it reaches points where it is useful, so little illumination is produced that direct light is much the best. A very white surface will not reflect more than 85 per cent. of the light which strikes it, while dark walls and ceilings and hangings reflect almost no light at all. The item of reflected light is then one of very uncertain amount at the results from a test of one lamp—a lamp chosen to represent the type because it was truly representative mechanically, and by check against other lamps was found to be representative in light distribution. The rough sketch of the lamp on each figure shows very nearly the actual shape of the filament whose candle power was measured. The left-hand sketch shows the lamp as it stood for measuring the horizontal candle-power at 0° and the right hand figure at 90°. In all the candle-power diagrams distance out radially from the center of the diagram to the heavy curves gives the candle-power in that particular radial direction. Thus, in the curve of horizontal distribution, if the lamp stood with axis vertical and one went around the lamp taking can-

dle-power of the light given in the direction toward him as he went on, these values of candle-power have been recorded and can be read off on the diagrams up to the heavy line. The same interpretation holds for the curves of vertical candle-power at the right of the figures.

All the lamps were kept at the voltage at which they give 16 candle-power on the basis of the manufacturer's rating. In the curves of horizontal distribution we see that lamp No. 1 with the straight U-shaped filament is quite uniform in candle-power all around. The candle power distribution of the long curl anchored filament (lamp No. 3) and the double

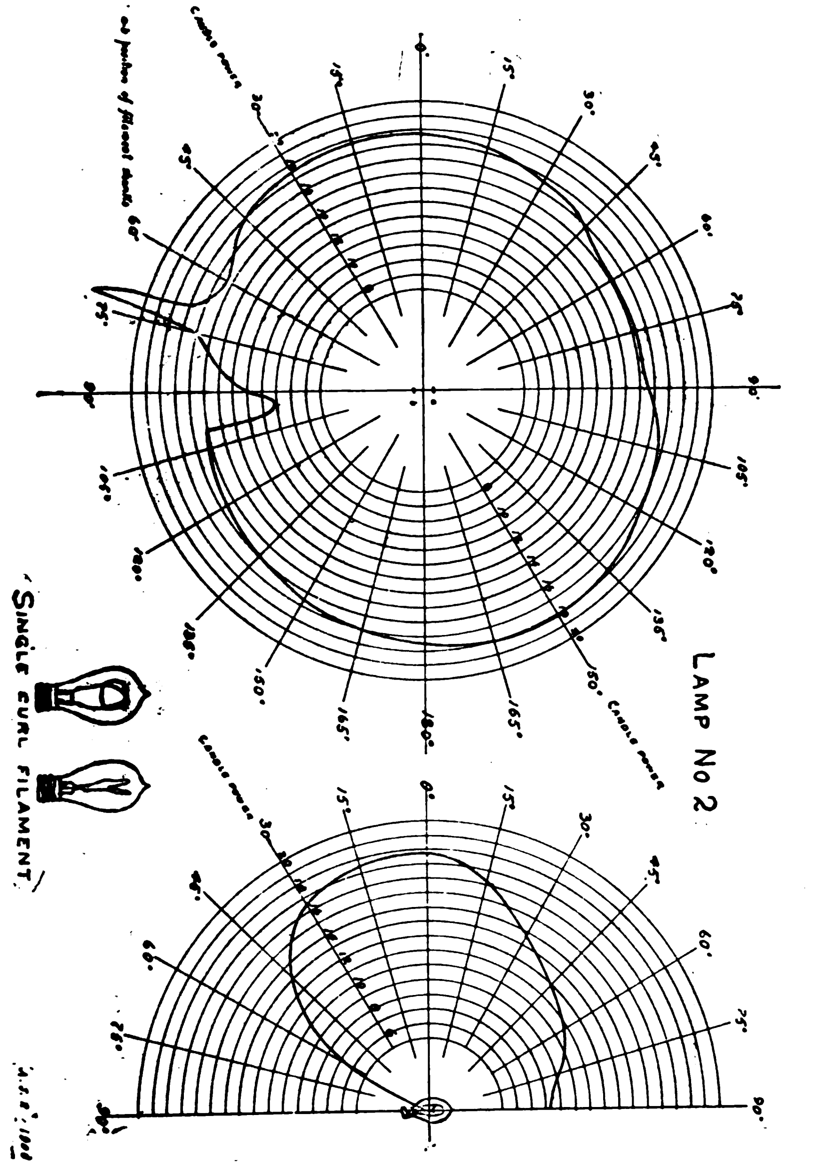

FIG. 5.

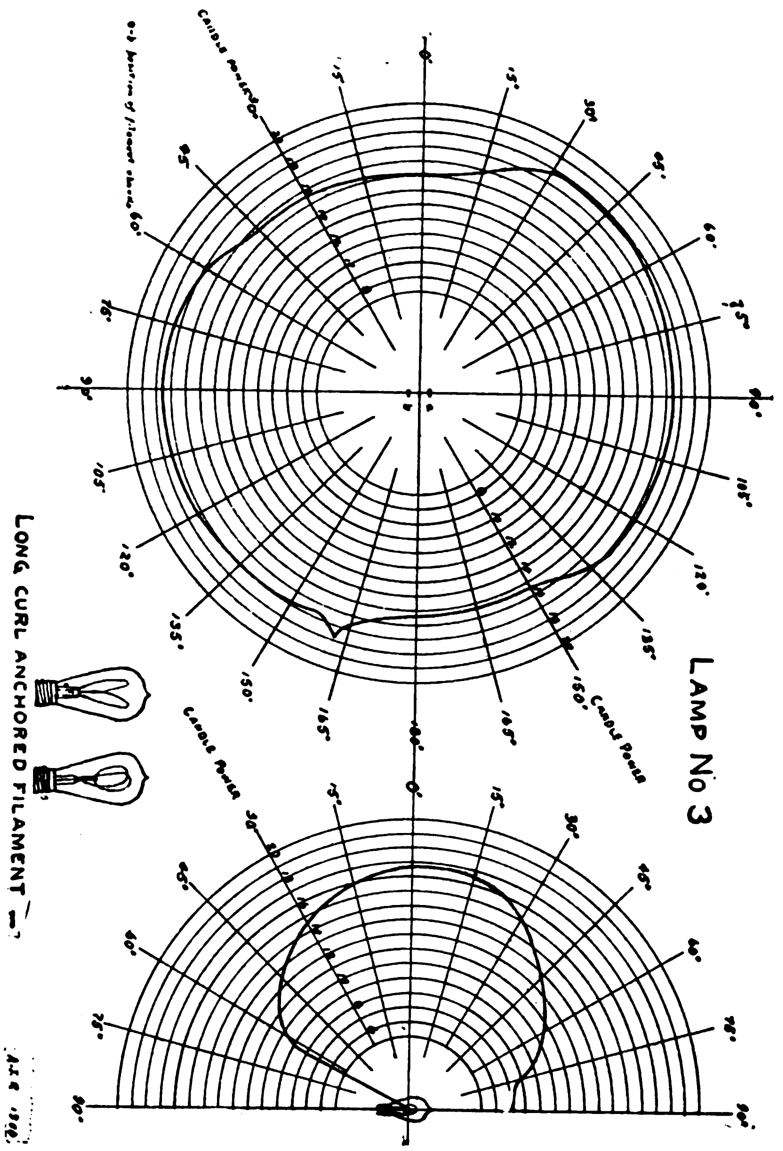

FIG. 6.

filament (lamp No. 4) are somewhat similar. The irregularity of the curves for lamps Nos. 2 and 5, coil filament types, is great. This is always distinctive of lamps of the sort. The striking irregularity at one point of the curve for lamp No. 2 is not abnormal. There are often two such breaks, one on each side of the lamp. The cause of this irregularity may be due to complex reflection and refraction of light due to varying thickness or curvature of the glass enclosure. It has not been investigated, I think. Since the manufacturer's rating is on the average or mean horizontal candle-power a lamp gives, the more uniform the candle-power curve of horizontal distribution, the more nearly perfect a lamp might be considered, I suppose. At least, this seems to explain design of the most recent filament forms.

But by far the most important distribution is that in a vertical plane. Here the great differences in candle-power procured from various filament forms show best. Look at the curves Lamps Nos. 1, 3, 4 are dreadfully deficient in light from the tipped end, and the candle-power of each falls off very rapidly as the 90° angle is approached.

How especially is this true of lamp No. 4, which, just as one comes to the direction from which the light is most important (between 75° and 90° at the tipped end), drops the candle-power down to less than five units. Most of the lamps, curiously enough, give most light in zones beyond the horizontal toward the base, where its usefulness is very problematical. This is true, too, of lamp No. 5, which maintains the candle-power it gives so well out toward the tipped end. It sends a good deal of light toward the base, but if we have a good light where it is useful, we must not criticise too severely the delivery of light where it has no especial value. The effect of the omission of the sealed-off tip on this lamp in helping up the candle-power at the end is well shown in the curve of vertical distribution for lamp No. 5, where from 75° to 90° the candle-power keeps up. This is due partly to the way the loops of the filament are spread, and partly to the omission of the tip.

WHAT IS A 16 CANDLE-POWER INCANDESCENT LAMP?

It does not take much consideration of these curves to satisfy one that a 16 candle-power lamp is not necessarily one which gives 16 candle-power where this much light is wanted. The candle power of incandescent lamps is determined really in a very empirical and arbitrary fashion. Most people seem to think it is as surely known as the watts used, and is as readily measured. But really it is about as vague and elusive a value as the candle-power of an arc lamp, for which it has facetiously been said that it gives 2,000 candle-power because at any street corner it delivers 500 candle-power in each of the four directions.

The common method of measuring candle-power in use by the manufacturers of incandescent lamps is to spin them at 180 revolutions per minute on a vertical axis and measure the average horizontal candle-power by a single reading. How this comes to be accepted as satisfactory, and what the status of candle-power measurement of incandescent lamps is, will be worth a little consideration right here.

When incandescent lamps first became commercial they were put into competition with gas lights and were made so they would measure 16 candle-power when placed in a photometer, precisely as gas lights had to be placed—base down, and the old U-shaped filament with a plane through the shanks of the U perpendicular to the photometer bar. Indeed, since photometers (except for purely scientific investigations) were used only for measuring the candle-power of illuminating gas, these

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very photometers were used for the incandescent lamps; and methods for gas photometery were adopted as far as possible into their candle-power measurement. It was soon clear that some more complete sort of measurement ought to be made, and in 1885, in connection with important tests of incandescent lamps for their economic value, probably the most elaborate tests ever made, the Franklin Institute adopted a method of measuring the mean spherical candle-power which was really an empirical or arbitrary one, but gave as a result a candle-power value quite nearly the true average of all measurements when the lamp was viewed from all possible directions.*

The measurement of the mean spherical candle-power by the Franklin Institute method requires that at least between forty and fifty measurements on the photometer be made, and the average of thirty-eight determinations is taken to get the result. About two hours' time for two operators with a well equipped photometer laboratory is required for the measurement of one incandescent lamp, while the apparatus required, as supplied by instrument makers, is defective in that it does not enable satisfactory measurements of the light radiated in directions near the lamp base to be made. While, then, this method came near giving the real average candle-power of a lamp, it could not well be used by lamp manufacturers in rating their product, nor was it. Most of them rated their lamps by the candle-power measured when the lamp stands vertically with base downwards and the bar of the photometer points to some selected side of the lamp. Some attempts were made to use a constant number by which this reading of candle-power might be multiplied to give the mean spherical candle-power for a given type of lamp, but without success in commercial usage.

In recent years, lamps have been measured by their mean horizontal candle-power and so rated. To save time, the manufacturer has lamps standing in the position already described, but has them rotating when the candle-power is measured; 180 revolutions per minute is a common speed, and the voltage marked on the label is that required to give 16 candle-power when the lamp is so rotating. The user who checks the manufacturer's product as it is delivered to him must perforce use the same method.

The National Electric Light Convention, not satisfied with the uncertainty of the methods in use, and in order to procure uniformity of standards and practice in rating lamps appointed a committeee, who made a report at the convention in June, 1897, in which they say that the mean spherical candle-power is the only proper and fair value to consider in comparing lamps. The practical measurement of this is so difficult, however, that a simpler method was recommended whereby the average luminous output of the lamp might be measured. The proposed measurement was to be taken "in the direction inclined 45° to the axis of the lamp, while the lamp is revolving upon its axis, the distance of the lamp from the photometric screen to be regarded as the distance between the center of the axis of its bulb and the screen. This will furnish a fair approximation of the mean spherical candle-power and reduce the amount of labor in measurement to the minimum." Two revolutions per second or 120 revolutions per minute was recommended as a speed of rotation.

A year later, in June, 1898, the same committee made a further report telling of tests made, confirming the committee's suggestion of measurement at 45° of inclination and making the proper speed 200 to 250 revolutions per minute. The committee was continued and made another report at the last meeting of the convention, but altogether on other phases of the subject—photometers, standards of candle-power, etc. Here the matter rests. In spite of the official adoption of the report by the convention, manufacturers continue to rate their lamps by a measurement of mean horizontal candle-power with the lamps in rotation at

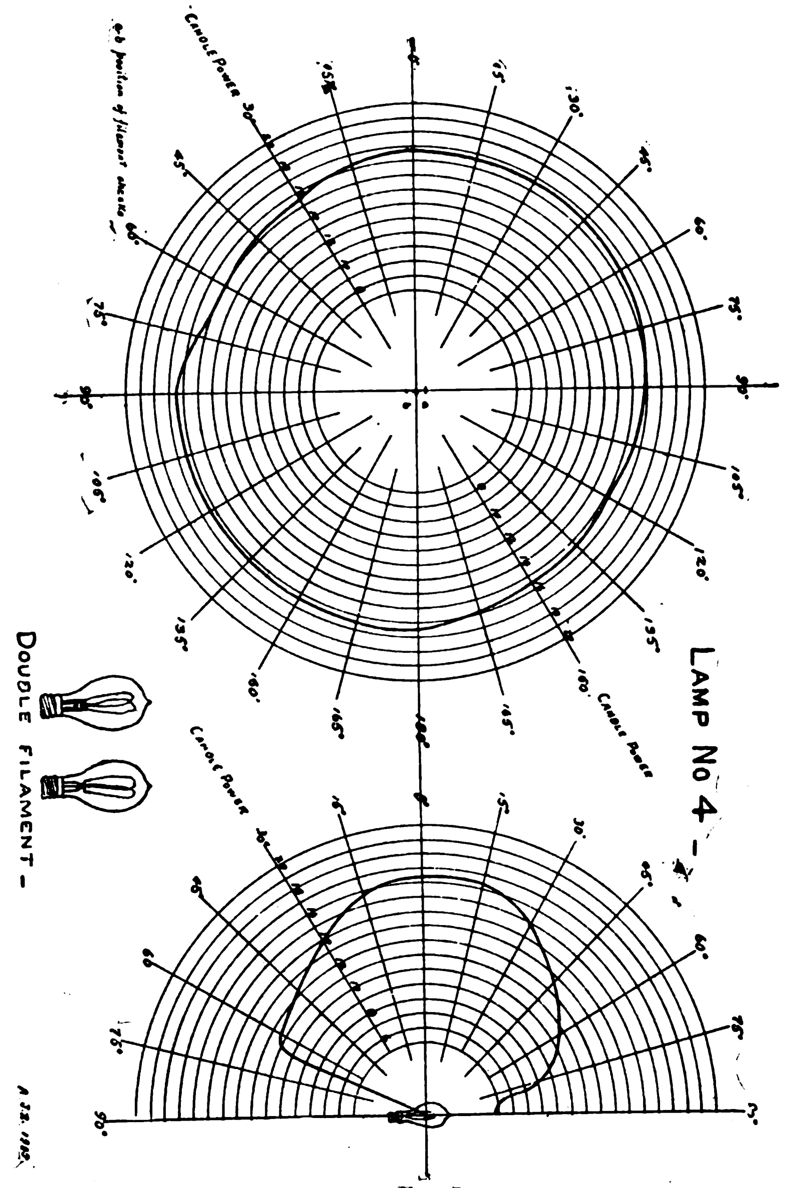

Fig. 7.

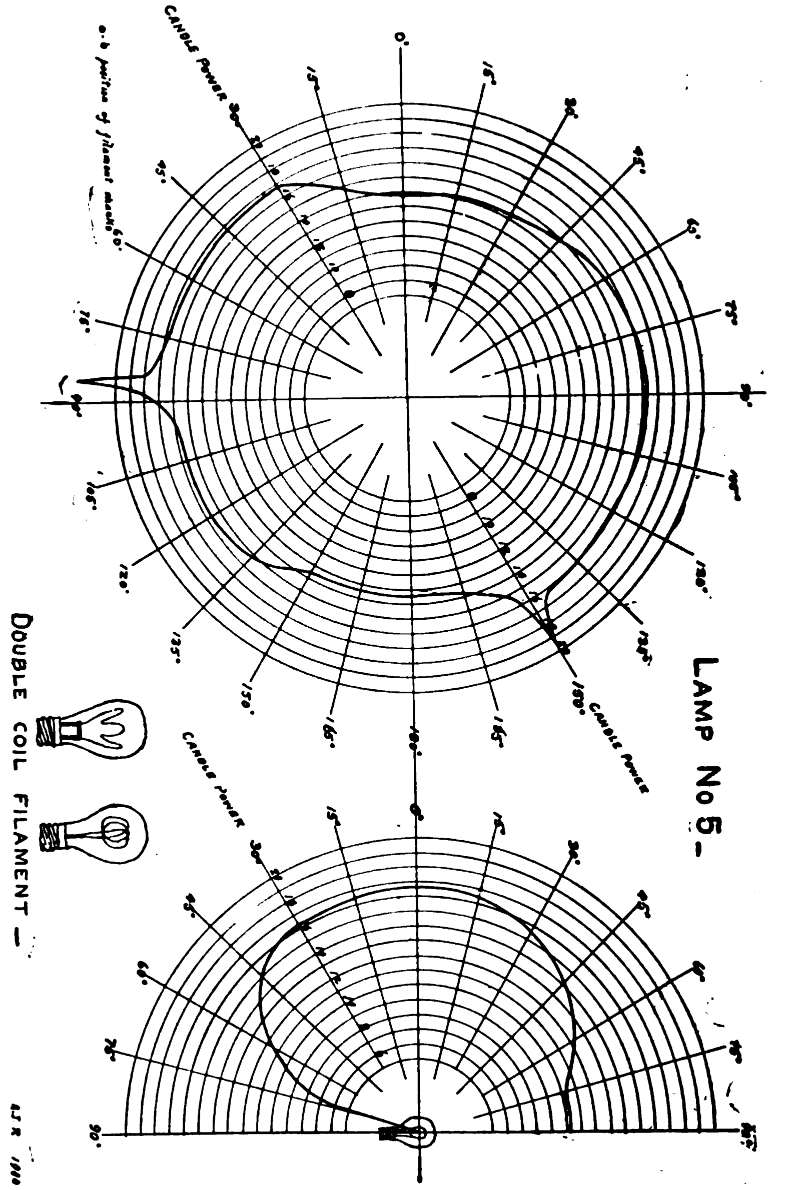

Fig. 8.

*The influence of candle-power measurements of gas upon similar measurements of incandescent lamps is well shown by the fact that the photometer expert of the Franklin Institute committee was Dr. Ward, the Philadelphia gas light photometric expert.

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180 revolutions per minute. There is no photometric apparatus made which can be satisfactorily and continuously used for the measurement adopted by the National Electric Light Association, and if there were, the indefiniteness of the conclusions reached leaves much to be desired.

Candle-Power Taken.	Candle-Power. Single U-Shaped Filament.	Single Curl Filament.	Long Curl Anchored Filament.	Double Filament.	Double Coil Filament.
a. At 180 revolutions with axis vertical	16	16	16	16	16
b. Mean horizontal, standard method	15.8	16.2	16.6	16	15 72
c. Mean horizontal, from plotted values	16	16.7	16.7	16.1	15.6
d. Mean spherical, standard method	12.7	13.5	13 75	13.2	13.8
e. Mean with axis at 45°	10.5	12	11.7	12	14
f. Mean hemispherical	14.3	14.5	14.6	14	14.5
g. Mean within 30° from tip.	8.7	10.3	8.7	7.9	10.9
h. From the tip.	5.7	8.35	7.05	4.8	10.1

FIG. 9.

Candle-power of lamps with different forms of filaments.

In Fig. 9 I have set down a number of candle-power values for each of the five lamps of which some data was given in Figs. 4 to 8, inclusive. Each of these gives a value of candle-power by which the lamp might be called. The values were procured as follows: A lamp was set at 16 candle-power when rotating at 180 revolutions per minute with the lamp axis vertical, in the common arbitrary method, and for all measurements involved in the other tabulated values was held at that voltage. Values in line b were determined by taking the average of twelve readings as the lamp is turned, beginning with its standard position and at every succeeding 30°. Values in line c are computed from the curves in Figs. 4 to 8, which take account of all horizontal candle-power variations. The line of mean spherical candle-powers is computed by the Franklin Institute method. Notice how much less the real average is than the rated candle-power in each case and how this average compares with the rated value for each type of filament. Line e gives the candle-power these lamps should have been marked if rated by the National Electric Light Association's standard. The readings are not by a rotating socket, but averaged from readings made individually from the lamps tilted at the right angle. It will be noted that this agrees poorly with the value of mean spherical candle-power and bears no easy numerical relation to it. Line f of the mean hemispherical candle-power is to be compared with the spherical candle-power values, and this in turn with the line g, in which average candle power is included every ray of really useful light. Line h is set down for comparison and to mention later. With such an array of candle-power values for each lamp, what is its candle-power?

WHAT SHOULD A 16 CANDLE-POWER LAMP BE?

Earlier it has been pretty thoroughly explained that the only sensible candle-power by which to call an incandescent lamp is that which is useful in producing illumination at desired points. Such a method has never been used in marking incandescent lamps for sale. It is strange how precedent binds us in everything we do. Here in the matter of incandescent lamp candle-power we are all tied to methods of designation which look back to photometric methods used for gas burners. True, mean spherical candle-power and rotation methods are distinctively electrical, but they first came to be of importance because incandescent lamps are so commonly placed in positions impossible to gas burners; and the rotation methods are used simply to save time in measurement, one reading taking the place of a dozen. It has already been explained that mean spherical candle-power is an impossible measurement for commercial purposes. Rotation methods are poor, too. Not only does the speed of rotation affect the result procured, but some of the best modern lamps produce such a flicker at the car of the photometer when rotated at standard speed (180 revolutions) that not only is the making of an observation most trying to the eyes, but the observer can only make a rough guess for the position of his screen when a balance is obtained. A recent suggestion to choose such a speed for each lamp as just removes the flicker is impractical, also, for not only does it require an adjustment of speed with different lamps, but with many filaments high speed of rotation distorts the filament or even throws it against the glass, due to centrifugal forces brought into operation by the high speed.

What more rational, then, than to measure the lamp's candle-power looking in at the end? It is the light coming from the end which we make use of—which we are interested in. Then this is the light to measure, and that by which the lamp should be rated. Lamps measured thus are as comparable with each other as lamps measured any other way. The apparatus required to make the measurement would be very simple, for no rotating device would be required and the lamp need only be inserted in the socket without any care as to which side comes uppermost when its candle-power is determined, since the candle-power must always be read the same. Thus, readings of different observers would agree without respect to anything involved in the measurement, except the standards used and the personal element, which never can be eliminated. Such a radical change of method, however sensible the change, could not be made without the sanction and support of some of the large associations of electrical engineers. In the meantime, however, for eventually this method must certainly come to be used, all lamp users should, in addition to a measurement of candle-power in the conventional way to check up the lamps purchased, take a reading of the useful light out from the tip.

A 16 candle-power lamp should be one giving 16 candle-power from the tipped end. The horizontal candle-power might be considerably less and be irregular in different directions without altering the real value of the lamp. An ideal 16 candle-power lamp would perhaps be one which measures 16 candle-power from the tipped end, had 16 candle-power as the mean horizontal candle-power, and was of nearly 16 candle-power mean spherical. Such a lamp could be turned into any position in an electrolier and still give an illumination as good as before and as well distributed.

In most lighting, also, the end of the lamp which has been called the tipped end all along should be tipless. Hold a piece of white paper below an ordinary tipped lamp hung with the tip down, as it commonly is, and the reason is unnecessary to state. Variations in thickness of glass and shadow cast by the tip make lines of light and shade that spoil all real value of light procured.

Since the making of such lamps as these is doubtless but a choice of filament form and arrangement, let us hope it will not be long until there are some ideal lamps available commercially.

WHAT IS A 3.5-WATT LAMP?

So far no word as to the efficiency of lamps has been said. It does not directly affect the candle-power nor distribution of candle-power. All the lamps mentioned above, for instance, were 3.5-watt 16 candle-power lamps. But why are they 3.5 watts per candle-power? Each lamp used burned with a consumption of 56 watts. The efficiency or watts per candle-power is strikingly varied by the candle-power to which reference is made. In Fig. 10 are set down the efficiencies of each lamp of the five types, calculated on the basis of the candle-power values in Fig. 9. A 3.5 watt lamp turns out to be one which uses this much electric power per candle-power if this is reckoned at its highest value, the mean horizontal. What a terrible inefficiency these lamps have if we calculate the watts per candle-power from the useful light or the light from their tips!

Watts Based on Candle-Power, as stated.	Watts per Candle-Power. Single U-shaped Filament.	Single Curl Filament.	Long Curl Anchored Filament.	Double Filament.	Double Coil Filament.
k. At 180 revolutions with axis vertical	3.5	3.5	3.5	3.5	3.5
l. Mean horizontal, standard method	3.51	3.45	3 37	3.50	3.56
m. Mean with axis at 45°	5.33	4 66	4.79	4.66	4.00
n. Mean spherical.	4.40	4 15	4.07	4.23	4.07
o. Mean hemispherical	3.92	3.86	3.83	4.00	3.86
p. Mean within 30° of tip	6.44	5.44	6.44	7.09	5.14
q. From the tip	9.82	6.71	7.95	11.70	5.54

FIG. 10.

Watts per candle power of 16 candle-power incandescent lamps on basis of different candle-power ratings.

Lines p and q of Fig. 10 give this. Lamps 2 and 5 are the only ones whose efficiency reckoned in a rational way is at all reasonable. The lamps of Fig. 10 all were supposed to have the same average life and would not be very far different in maintenance of candle-power during life. If a lamp can be made which gives 16 candle-power out from the tip and burns at 5 watts per candle-power, we will have a lamp which is better than any now made. If its life is as good as the present 3.5 watt lamps, it would be a much better lamp than any we have now for all commercial usage. Keeping, however, to lamps now made, the table of Fig. 11 gives the relative cost of current per 16 candle-power of useful light (light from the end) from each of the five different filament types now made. The computation is on the basis of 12 cents per kilowatt hour for electrical energy, and the cost is per 500 hours of burning (the average life of a lamp).

Type of Filament.	Cost of current per 16 candle-power of useful light and per 500 hours' service.
Single U shaped	$9.43
Single curl	6.44
Long curl, anchored	7.62
Double	11.[illegible]0
Double coil, tipless	5.32
Double coil, 10 candle-power mean horizontal	$4.10

FIG. 11.

Since we only use electric current in incandescent lamps for the light we get, and since it is the cost of the light which is the vital, commercial problem, the table needs no comments to show which filament types are best, that is, which ones are most economical to use. I have

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put lowest in the table the cost of current per 16 candle-power of useful light from a standard 10 candle-power (mean horizontal) double coil filament lamp. This lamp gives 8.2 candle-power out from the tip. It is worth noting that a 10 candle-power lamp (so-called), with this type of filament, gives as much candle-power out from the tip as any one of the other types which are rated at 16 candle-power. Hence, such a lamp using only 35 watts gives as much useful light as any of the other four types which require 56 watts.

A NEW FORM OF FILAMENT

Since making the preceding tests, there have been developments which are worthy of special mention. A new type of filament for commercial lighting has come into being. The following matter describes its interesting features.

The Shelby filament, which is the most recent product of that company, has been designed and arranged especially to produce a high candle power in the vertical direction. In Fig. 12, is shown the average vertical distribution of candle-power from the new lamp. I call attention first to the arrangement of the diagram—I show the base of the lamp upward—exactly contrary to the conventional arrangement of vertical candle-power diagrams since 1885.

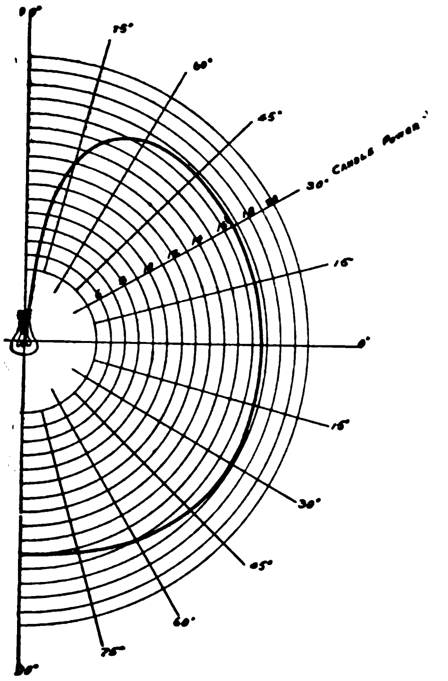

FIG. 12.

This method of plotting is natural and suggests at once the value of large candle-power downward (below the lamp). It is another step away from the conventions introduced into incandescent photometry long ago from gas photometer practice. I call attention next to the sort of filament and bulb tested—the rude sketch at the center of the diagram only suggests it. The filament itself is a good deal like the old Shelby coil (see Fig. 8 preceding), but with the circular coils flattened vertically, so that a much greater projected length of filament shows from the end. The bulb also is much flatter at the end than other standard forms, and the light comes through it nearly at right angles to the glass. The lamps, for which data is given, were made tipless. The loss of light through the tips of lamps having filaments so spreading as these would be very slight,

In the diagram there is to be noted a wonderfully maintained candle-power as one passes from the horizontal to the vertical direction.

The lamp as I received it was one of a lot, none of which were marked for voltage, and I set it at 16 candle-power when rotated in the usual way and made all subsequent measurements at the voltage so determined. The results set down are therefore on my rating—not on the manufacturers'. To understand the real meaning of the test data set down beside the curve of vertical distribution, comparisons must be made with similar values in the preceding part of this paper. The vertical candle-power (almost 15) is beyond comparison with that given by all filament forms except the double coil, which it even excels by 37 per cent. The mean spherical candle-power is also remarkable. The highest I know of in lamps rated in similar manner is below 14. A glance at the table of efficiencies of Fig. 10 shows by comparison with figures here the economy of the lamps. It may seem strange that a horizontal distribution is omitted in the test. This is purposely done. Regularity and irregularity of candle-power in horizontal direction is quite unimportant compared with the vertical. The average horizontal is shown in the vertical plot, and beyond this it is quite unnecessary to go, for all we need care to know of an incandescent lamp as regards its candle-power is—1st, what is the vertical candle-power and 2d, what ratio beteween this and the average horizontal.

A second test was made on a 10 candle-power lamp having the same form of bulb and filament. It was treated and rated in precisely similar ways as those used with the 16 candle-power lamps. A tabulation below shows the results procured. While the lamp had a lower efficiency than the 16 candle-power, it shows the same general characteristics. The vertical candle-power is 86 per cent. of the horizontal, and by the National Electric Light Association's rating, it would be of almost as high candle-power as if rated by usual manufacturers' rotating method:

10 CANDLE-POWER SHELBY FILAMENT.

Vertical candle power	8.7	(Watts per C. P.)	
Mean horizontal "	10.06		
Mean spherical "	97.8	on vertical C. P.	4.7
Mean with axis at 45 deg.	9.87	" horizontal "	4.05
Mean hemispherical	10.05	" spherical "	4.17
Cost of current per 16 C. P. useful light and per 500 hour service			$4.50

The above lamp used 41.8 watts at 112.35 volts.

I take it that the production of such a filament, such as vertical candle-powers and such efficiencies as these, are evidence of a demand for lamps of the sort. I cannot but feel that a new era in incandescent lighting has dawned when this is so. In future lamp specifications, we may look to see a requirement set down as regards the vertical candle-power of lamps, and the ratio of this to the mean horizontal. In fact it cannot be long before specifications for lamps for commercial lighting, will ask for a certain vertical candle-power and watts per candle-power on this rating, with a requirement as to a minimum horizontal intensity.

DISCUSSION.

Mr. W.C.L. Eglin, of the Edison Illuminating Company presented a reflector lamp, which he explained was made on the same lines as the Shelby lamp described in the paper, but with the effect magnified. The light from this lamp was wholly through the end, and he claimed for it an efficiency of 1.5 watts per C.P. in the direction the light was thrown. He further stated that the coil form of filament was old, having been used in some of Mr. Edison's early lamps. Mr. Eglin went on to say that the light out horizontally from an incandescent lamp, which strikes the walls, is important and necessary in producing good illumination, and so the horizontal candle-power should be considered. He attached no great value to initial measurements, and questioned the life and maintenance of candle-power of the Shelby coil filament.

Mr. Francis Head, of the Union Traction Company, in reply, stated that he had carried a number of such coiled filaments through a life test, and they had proved fully equal to any of the other makes.

Prof. Arthur J. Rowland, author of the paper, said that the paper carefully avoided the question of life and maintenance of candle-power, since the intention was to deal wholly with light distribution. The light distribution must remain the same throughout the life of any lamp, without respect to decrease in candle-power. He admitted that the coiled filament in the old type Shelby lamp was not new. and called special attention to the wonder that the advantages it gave had never been discovered; for this form alone gives a good candle-power distribution. He further said that the light out to the walls was of course a good thing, in order to have them properly illuminated; also, that the light reflected from them may be of a little use when the lamps in service give but low candle-power out from the end opposite the base. As a matter of fact, the useful illumination produced by light reflected from the walls is almost negligible since it has to pass through the long distance to the walls and back again. Its only value is to break up shadows and aid diffusion, as shown numerically in the paper. Moreover, if this kind of light is useful, the Shelby coil filament has as much light to send out to light walls and for reflection as any other, while the direct light from it is much greater. A reflector lamp has use in certain specific instances; for example, to supplement general lighting over a desk when it takes the place of a lamp with such a reflector as a McCreary shade. It is not practical for commercial lighting, however, since it limits the light absolutely to the direction in which the reflector sends it, and produces strong sharp shadows.

REFLECTOR LAMPS.

There is nothing new in reflector lamps; they were introduced into this country some years ago by a foreign manufacturer, and more recently have been produced by several American manufacturers, and classed with their special lamps Very recently the General Electric Company has brought out a reflector lamp of the same general style as those which preceded it.

For certain purposes, a reflector lamp is useful. It may supplement general illumination and give concentrated light to advantage where this is desired, but it cannot be successfully used for commercial lighting for several reasons.

The light is all directed one way, and absolutely cut off from every other direction. This gives one a bright spot of light under the lamps, but dark spaces between, around, and above them—quite dark except for reflection from the few objects illuminated. Nothing can be more trying to the eyes than to look from brightly lighted objects to those not lighted at all, and back again.

An ordinary reflector lamp, acknowledged to consume 50 watts, is extravagantly used for lighting even though the efficiency may be 1.5 watts per C.P. in the direction in which the

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light is thrown, for the reason that it illuminates only a small area. With it, general illumination would be necessary at additional cost.

A reflector lamp combines a reflector and a lamp in one. While the combination may cost less than lamp and reflector bought separately, when the filament burns out the reflector is gone too; hence, at the price these lamps are offered, they are too expensive for general use. Separate reflectors are much to be preferred where it is really necessary to use them.

In comparison with the other lamps which are used regularly in commercial lighting, the reflector lamp suffers. It gives no horizontal light at all, and the importance of a certain amount of this light is recognized by all good lighting engineers. Any lamp which gives enough light in the vertical direction to be economical and gives light out besides, in the directions which assist general lighting and diffusion, is far superior to a reflector lamp. It is found that the old double coil filament has these features, but it is greatly exceeded by the new Shelby coil (about to be placed on the market), as is shown by photometric tests. Whether a lamp which gives 16-candle power horizontal and 16-candle power vertical is better than one which gives 6-candle power horizontal and 16-candle power vertical, is an open question. Everyone must agree that there is some limit below which the horizontal candle power of a lamp should not be decreased, and this is before the zero point is reached.

If reflectors over lights to throw the whole light flux in the vertical direction are necessary for any sort of lighting, that lamp is best which uses a form of filament giving high candle power in the vertical direction without the reflector. By reflection, one adds only to the direct light. Of two lamps having a given light flux to reflect, that one having most initial candle power in the direct rays, will have the brightest light after a reflector is put in place. A Shelby coil filament turns out then to be better than any other form when used with a reflector or shade as well as without.

PARIS LETTER.

Special Correspondence of ELECTRICITY.

Direct Current Generators at the Paris Exposition.

In a previous report we gave the list of the various generators supplying motive power for the electric lighting of the Exposition, we will now examine each of these generating groups separately, commencing with those of the direct current generators.

GROUP 1—SOCIETE ALSACIENNE DES CONSTRUCTIONS MECANIQUES DE BELFORT.

The group consists of a vertical two-cylinder double-expansion-condensing Woolf engine with Corliss valves. Its effective power at an initial pressure of 8 kilos per square centimeter amounts to 1,200 hp. at an angular speed of 70 revolutions per minute. The diameter of the high-pressure cylinder is 0.85 meters, that of the low-pressure cylinder is 1.35 meters. The piston stroke is 1.20 meters. The driving shaft with two cranks set at 180 degrees has a total length of 9 meters and weighs 10 tons. It carries on one end a fly-wheel of 5.7 meters diameter weighing 31 tons, and on the other the armature of the dynamo. This driving-shaft is supported on six bearings.

The full capacity of the dynamo is 1,500 amperes at 500 volts. The 12 induction poles are cores of cast-steel, 45 centimeters long and presenting a section of 2,100 square centimeters. The coils are of copper wire of 21 mm. thick. The total resistance of these coils, arranged in series, is 24 ohms. The whole of the inductor is solidly supported on one side of the steam-engine base. This arrangement of the pole-pieces admits of very short magnetic circuits and a very powerful magnetic flux on account of the large space (section) given to the cores. The dynamo is wound in multiple arc. The armature consists of a gramme-ring of large size with a smooth core having an exterior dimeter of 3.81 meters, interior diameter of 3.42 meters. The disks of the annualar core are of special soft steel-plates, insulated by gum-lac paper. The whole armature is kept in position by a cast-iron star of 39 arms which is keyed to the driving-shaft. The diameter of this star is 4 meters and weighs 7½ tons, being cast all in one piece. The winding is on U-shaped copper plates set in paper sheaths and placed in horseshoe form towards each other on the internal surface of the core, so that all the disengaged ends extend above the exterior surface. Each winding turn has a section of 60 square millimeters. The total resistance of the armature at a temperature of 40 degrees Celsius is 0.006 ohm; the number of turns is 2,268 and the tangential speed 14 m. per second. The current is collected by 12 sets of brushes, four of them to each set; the diameter of the brush-support is 4½ meters.

The loss in the dynamo is 22.5 kilowatts working at full capacity, with an excitation of 9,000 watts. Joule's effect in the armature is 13,500 watts, hysteresis and Foucault's currents 7,800 watts. The electrical efficiency is therefore 97 per cent.

GROUP 2—SOCIETE DECAUVILLE AINE AND CREPELLE AND GARAND.

The horizontal compound steam engine is 1,200 hp. with the cylinder diameters of 0.71 and 1.32 meters respectively and a stroke of 1.60 m. This engine drives a shaft carrying the armatures of two dynamos of equal size. Each of them have an output of 400 kilowatts at an angular speed of 75 revolutions per minute, they can furnish 1,600 amperes at 250 volts. The two parallel-coupled dynamos furnish 3,200 amperes at 250 volts. This consequent-pole inductive construction carries 10 cast steel plates of 340 millimeters long serving as a core to the induction coils which are wound with nine layers of copper wire of 5.3 millimeters diameter.

The armature has a cast-iron core formed of two pieces and keyed to the driving shaft; it serves as a support for the armature core formed of rings of assembled plates 0.5 millimeter thick and insulated by lac-paper. The winding is of the multipolar thick drum type with jointed sections in parallel. It contains 625 rectangular profile cable sections of two, six, four by seven millimeters, insulated by four layers of cotton. The connections are made by double copper plates 30 centimeters long, three centimeters wide and 1.8 millimeters thick. The length of the collector is 2 m. with a width of 26 cm. It carries 625 copper plates insulated by mica. The current is taken off by ten series of carbon brushes. The total weight of the two dynamos is 58 tons, each armature weighing 12.5 tons.

GROUP 3—BREGUET AND SOCIETE DE LAVAL.

The two groups three and three[a] are the same. Each of them consists of a Laval steam-turbine of 300 hp. directly coupled to two twin dynamos in series.

Each of these dynamos is capable of developing 100 kilowatts at an angular speed of 780 revolutions per minute and to yield under normal condition 825 amperes at 125 volts. The field pieces are case-hardened composed of four poles, two of them only are furnished with energizing coils. The poles measure 410 by 284 millimeters giving an area of 1,164 square centimeters. The diameter of the bore is 568 millimeters, that of the inter-air-space seven millimeters. Each coil is made up of two copper wire sections. The energizing current strength is 1.6 amperes per square millimeter, and the number of ampere turns for each field is 15,000. The dynamo is energized in multiple arc. The rheostat is fitted up with twenty contacts and has two handles, one is used to change the resistance ohm by ohm, while the other is intended to obtain intermediate resistances. The armature has a laminated and toothed ring-core. The exterior diameter is 554 millimeters, the interior diameter is 310 millimeters. It is mounted on a cast-iron star furnished with six arms. The two armatures are keyed directly to the two turbine driving shafts. The core contains sixty half closed notches. The winding is of the drum type. The current density in the armature is 2.69 amperes per square millimeter. The armatures of the two dynamos can be coupled either in series or in parallel.

The collector carries 120 plates; its diameter is 270 millimeters. The current is collected by four series of brushes arranged in couples. The output at full load is 825 amperes, each brush carrying from 34 to 35 amperes. These two groups of direct current generators are intended to balance the bridges of the three wire general distribution at the Exposition. As the two dynamos in each group can be coupled in series, a potential difference of 250 volts between the neutral and the two other wires can be provided for.

The Laval 300 hp. turbines have driving wheels of 80 cm. diameter and a speed of 9,000 revolutions per minute. The shaft of this wheel is turned by means of a pinion on two toothed wheels revolving at 780 tons per minute. These wheels operate through elastic couplings, and they carry the armatures in the same direction. Steam is supplied to them at a pressure of 10 kilos per square centimeter, and distributed by eight valves, four of these valves are conically shaped for conducting the exhaust to the condenser, and two are of cylindrical form for the free exhaust, while two conic spring valves are balanced for pressure at 7 kilos per square centimeter. The consumption of steam per effective hp. hour is 16 kilos with free escape and 7.5 kilos with condensation.

The installation of the whole group, including the turbine, the speed-reducing apparatus and the two dynamos required a space of 4,116 meters long by 1.91 meters wide and 2.38 high, the total weight of the complete outfit being 11,500 kilos.

A GERMAN paper states that it is proposed to use the great beds of peat which exist in Northern Germany for the purpose of producing electricity on a large scale. There are about 1,000 square miles of peat area, and an enormous quantity of good fuel could be obtained therefrom. The fuel from this source should prove to be very cheap when compared with coal, and both producers and consumers would, in all probability, obtain some benefit from its use.

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THE CONVENTION OF MUNICIPAL ELECTRICIANS.

The fifth annual meeting of the International Association of Municipal Electricians was held in Pittsburg, September 25, 26 and 27, and proved one of the most successful gatherings this Association has yet held.

The first session was called to order Tuesday morning by President William Brophy, of Boston, Mass. The Rev. John A. Jayne, of Allegheny opened the session with a prayer, after which S. U. Trent welcomed the electricians to the city of Pittsburg. The response on behalf of the Association was made by President Brophy, who commended Mr. Mead, the committee of arrangements, and the city, on the enterprise and hospitality showed in the arrangements made.

The President then delivered his annual address, after which reports from the various committees were read.

During the convention the following papers were read and discussed: "Benefits to Be Derived From Our Association," Captain William Brophy, Boston, Mass.; "Contact Points," Frank C. Mason, Brooklyn, N. Y.; "Trials and Troubles of Instituting and Enforcing Municipal Inspection and Control," M. G. Canfield, Grand Rapids, Mich. A paper on "Automatic Fire Alarm Systems" was read by Charles Bergher, of Boston, as was one entitled the "Advantages and Disadvantages of High and Low Potential Conductors on the Same Poles," by F. W. Jones.

During the meeting Morris W. Mead referred to the subject of emergency work, and asked the members to induce their municipalities to adopt fire and police alarms which would work instantly all over the city at any time of the entire day.

There were about 250 persons in attendance including quite a number of ladies. The social features of the convention were most successful and were carried out as originally intended.

The next meeting of the Association will take place at Niagara Falls, N. Y.

Trade Publications Received.

We are in receipt of a handsomely gotten up pamphlet containing some fifty odd pages, descriptive of and illustrative of the calculagraph, which is coming more and more into use in telephone exchanges. By means of this instrument, which is manufactured by the Calculagraph Company of 9 Maiden Lane, New York, the time which elapses during a toll conversation is mechanically recorded.

An interesting catalogue has reached this office descriptive of the Long Automatic Lamp Support by means of which any chance of a carbon trimmer being shocked while handling a lamp, is done away with. These supports are manufactured by Harry Long, Greentown, Ind.

The American Endoscopic Company of Providence, R. I., has sent us a booklet which illustrates and describes in detail the many types of miniature lamps manufactured by this well-known concern.

The Kellogg Switchboard & Supply Company, Chicago, has recently gotten out Bulletin No. 1, which describes in detail the many varieties of telephones turned out by the company. The various fixtures and apparatus are illustrated by means of handsome half tones, while the many advantages of this type of 'phone are clearly set forth in plain, readable type.

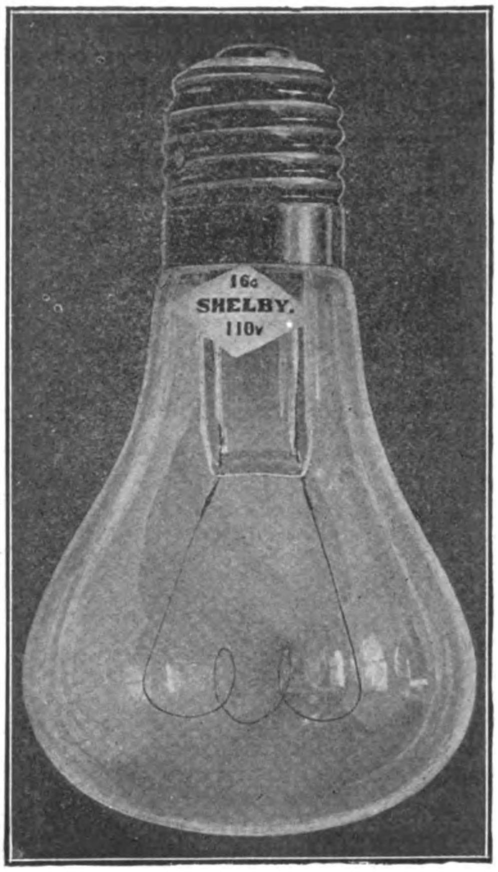
LEGAL NOTES.

Judge Traux has granted an order dissolving the firm of Schmidt & Bruckner, an electric company of 135 Elm street, New York City, and appointed Lambert Schmidt permanent receiver. Mr. Schmidt was appointed temporary receiver on January 5 in a suit brought by Frederick C. Bruckner against Lambert Schmidt for a dissolution of the copartnership on account of a disagreement between them.

The litigation over the Richmond, Ky., electric plant, which has been going on for more than a year, seems to be at an end. In the Circuit Court Judge Scott gave a judgment for $5,900 against the company, which is composed of D. J. Hauss, of Cincinnati; F. H. Adair, of Carlisle, and others. The contract between the plaintiffs and defendants, by which the former gained an interest in the plant, was rescinded and the plant ordered sold. The plaintiffs allege that fraud was practised by the defendants.

The New Shelby Lamp.

On page 198 of this issue will be found an article entitled "Mistakes in the Rating of Incandescent Lamps." The lamp shown in the accompanying illustration is the one that Mr.



Arthur J. Rowland tested so satisfactorily. This lamp is manufactured by the Shelby Electric Company of Shelby, Ohio,

PERSONAL MENTION.

Mr. Edward Adams of Toledo, O., has been appointed general manager of the Sandusky, Milan & Norwalk Electric Railroad.

Mr. Ernest J. Berg of the General Electric Company o Schenectady, N. Y., went to Europe recently and expects to be abroad about four months.

Mr. Charles T. Ames, formerly of the Boston & Maine Railroad, has been appointed general freight agent of the Stillwater & Mechanicsville, N. Y., Street Railway Company and the Greenwich & Schuylerville Electric Railroad.

Mr. Clarence Leach of Gouverneur, N. Y., has resigned his position as head electrician of the Oswegatchie Light & Power Company to accept a similar position with the Electric Light Company of Potsdam, N. Y.

INCORPORATIONS.

The New York, Philadelphia & Norfolk Telegraph Company, Wilmington, Del. Capital stock, $150,000.

The Lake City Electric Company, Lake City, Ia. Capital stock, $20,000. Incorporators: J. J. Coady, J. B. Smith, Ira R. Amey, Alva Conskaddon and M. E. Hutchison.

The Consumers' Heat & Electric Company, Bloomington, Ill.—to furnish steam and electricity for all purposes. Incorporators: George P. Davis, Edward Thorp and George S. Hanna.

The Gowanda Electric Light & Power Company, Gowanda, N. Y. Capital stock, $10,000. Directors: Charles E. Sipple, Charles P. Dean and George B. Pratt, all of Gowanda.

The Merchants' Gas & Electric Company, San Francisco, Cal.—to make and deal in gas and electrical appliances, etc. Capital stock, $1,000,000. Directors: V. Stow, R. J. Woods, A. A. Sanderson, E. C. Hutchinson, San Francisco, and E. B. Davis, Oakland.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED SEPTEMBER 25, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

658,336. Electric Railway. Edward M. Bentley, New York City. Filed Aug. 5, 1896.

658,445. Electric Car. Arnold A. Ingraham, Lowell, Mass. Filed Oct. 2, 1899.

658,541. Bond-Tie for Electric Railways. William A. Downing and James T. McHugh, Pittsburg, Pa. Filed Feb. 21, 1900.

658,581. Trolley. Alphonse Piton, St. Sauveur de Quebec, Canada. Filed April 17, 1900.

658,702. Car-Fender. John L. Conner, Washington, D. C. Filed May 16, 1900.

658,745. Trolley-Wheel. David F. L. Jones, Columbus, Ga. Filed Aug. 12, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

658,423. Carbon Rod for Electric-Arc Lamps. Hugo Bremer, Neheim, Germany. Filed Aug. 5, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

658,741. Electric Welding-Machine. Otto Parpart, Cleveland, Ohio, assignor by mesne assignments, to the Standard Welding Company, same place. Filed Jan. 31, 1898

MISCELLANEOUS.

658,388. Mechanism for Imparting Successive or Alternating Movements. Elisha Moore, Meductic, Canada. Filed Nov. 15, 1899.

658,431. Dynamo-Brush. Carl Endruweit, Berlin, Germany Filed Aug. 7, 1899.

658,476. Dynamo Regulation. Imile E. Storey, Trenton, N. J. Filed Feb. 23, 1900.

658,483. Process of Oxidizing Negative Electrodes for Primary Batteries. Clyde J. Coleman, Chicago, Ill. assignor to Thomas J. Ryan, New York City. Filed Dec. 20, 1899.

658,601. Appliance for Imparting Heat and Electricity to the Body. Ignaz Timar, Berlin, Germany. Filed Nov. 10, 1899.

658,612. Telephone-Directory. William J. Bell, Baraboo, Wis., assignor of one-half to Herman Grotophorst, same place. Filed May 24, 1900.

658,664. Thermostat. William E. Mack, Oswego, N. Y. Filed Sept. 19, 1899.

658,698. Electric Furnace. Charles S. Bradley, New York City, assignor to the Cyanide Company, Ampere N. J. Filed Feb. 10, 1900.

658,706. Electric Stove. Herbert S. Dowsing, London, Eng. Filed Sept. 12, 1899.

658,733—658,734. Secondary Battery. Clyde J. Coleman, Chicago Ill., assignor, by mesne assignments, to the General Electric Storage Battery Company of New Jersey. Filed Dec. 8, 1899 and Oct. 2, 1899.

658,739. Coin-Setting Electric Meter. Frank Kramer, Chicago, Ill. Filed Nov. 6, 1899.

REISSUE.

11,857. Phonograph. Thomas A. Edison, Llewellyn Park, N. J. Filed Aug. 18, 1900. Original No. 652,457, dated June 26, 1900.

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THE TELEPHONE WORLD.

Death of John E. Hudson.

John E. Hudson, president of the American Bell Telephone Company, dropped dead from heart disease on the morning of October 1, in the waiting-room of the Beverly station of the Boston & Maine Railroad in Boston.

Mr. Hudson was born in Lynn, Mass., on April 3, 1839, and had been connected with the Bell Telephone Company since 1880, when he became counsel for the company. In 1885 he succeeded T. M. Vail as general manager, and four years later he was elected to the presidency, succeeding Howard Stockton. Mr. Hudson was a graduate of Harvard, class of '62.

The stockholders of the Tidewater Telephone Company met in Gloucester, Va., a short time ago. J. A. Galliger, representing the Old Dominion Steamship Company, was elected chairman, and L. C. Catlett, secretary, of the meeting. W. E. Corr was unanimously elected president and W. A. Withers was elected vice president; Messrs. J. W. Down and W. N. Trader, of Mathews; J. A. Bristow, of Middlesex, and Messrs. J.L. Taliferro, and R. B. Weaver, of Gloucester Courthouse, were elected directors. All of these except Mr. Weaver were members of the former board. The superintendent's report showed that the company now has 175 miles of pole line, and 428 miles of wire, and 107 stations in operation. Arrangements were made to open an exchange at Saluda, and to extend the lines to Tappahannock, Va., as quickly as possible.

Millbury, Mass., patrons of the telephone are trying to study out wherein they would be benefited by the proposed central office and reduced rates for local service offered by the New England Company. If it is offered to put in telephones for local service at $18 a year and then charge 10 cents for every message sent out of town it is hard for subscribers to see the advantages of the new proposition. There is hardly a patron of a telephone in town who does not talk out of town at least four times a day. At the 10-cent rate this would amount to a good deal more than $100 per year. When the $18 for the local telephone is added it is safe to say that the price of the $18 local telephone will amount to about $150 a year. Under the proposed arrangement, a patron wishing to get a man who has the unlimited service and not the local will be under the necessity of paying a toll of 10 cents.

The special telephone committee appointed by the Board of Trade and Business Men's Association to investigate the question of rates in Norfolk, Va., recently made up a report to be forwarded to the board of directors of the association. No information was given out concerning the meeting, except that the committee's report had been made up. This committee has met several times and officers of both the Southern States and Bell Telephone Companies have appeared before it. At present it is almost impossible to forecast the committee's action. The report will be mild in terms, but adverse to the Bell Telephone Company.

The Minnesota Central Telephone Company held a meeting recently in St. Paul. The company operates about 800 miles of telephone line in the central part of the State. The directors chosen were: D. N. Tallman, John Williams, Willmar; Charles Webster, A. Webster, Waucoma, Ia.; E. G. Porter, Owatonna, Minn. The officers elected are: D. N. Tallman, president and treasurer; Charles Webster, vice-president, and John Williams, secretary.

The new telephone line from Chili to Churchville, N. Y. which was commenced two months ago is nearly completed and will be opened in a few days. The company has experienced no little trouble in getting the line through the village and has had to meet the objections of many of the village people who protested against the trimming of shade trees along the highway. The company will extend the line to Buffalo.

The Citizens' Telephone Company, a part of the system of the United States Telephone Company, is expending $125,000 in Fostoria, O., in the entire rebuilding of the local telephone plant. It has put in 21,000 feet of cable; every telephone in use will be a long distance 'phone, and a six hundred drop switchboard is being put in the new suite of offices.

Wabash, Ind., now has telephone communication with Indianapolis by the new independent line, running by way of Marion, Kokomo, Tipton and Noblesville, Ind. The rate is 40 cents for five minutes, as against 55 cents for three minutes with the Bell Company.

Long distance telephones to connect Fayetteville, Hamlet, Sanford, Red Springs and other towns in that section of North Carolina will soon be erected. The incorporators are Dr. H. W. Lilly, Dr. Thomas M. Rose and Mr. W. F. Leak.

Two Uses for One Wire Practiced in Berlin.

Consul-General Guenther, of Frankfort, gives some interesting facts about the plan adopted in connection with the Berlin fire brigade service of telegraphing and telephoning simultaneously over one line. He says:

"There are fifteen brigade stations in Berlin, each of which is served by a special network of fire alarms. From these stations underground wires radiate in all directions, each wire being connected with a great number of alarm pillars. The alarms are arranged for automatic working, and to each is fitted a key for telegraphing to the station. As it is, however, a very great advantage to be able to maintain during the progress of the fire a good connection between the alarm pillars nearest the fire and the brigade station, exhaustive trials have been made with a specially adapted telephone, which have resulted in the general introduction of the same.

"To the Morse apparatus at the station a stand is attached from which a micro-telephone fitted with a battery switch and a second receiver are suspended. The remaining apparatus is inclosed in a flat box and placed under the table. This box contains an induction coil, a condenser, and a circuit key. As it would be expensive to equip each of the fire, alarm posts with telephone apparatus, a portable set is used, which may be attached to the posts by means of a plug and socket provided for the purpose. Such a portable set is carried by each of the brigade carts, there being some eighty now in use. The brigades' cycles are also equipped with sets which are very compact in design.

"Experience with the system has shown that the switching in of the telephone apparatus in no way influences the telegraph service. During simultaneous telegraphing and telephoning a slight knocking is perceptible in the telephone, which, however, does not destroy the audibility."

That the business men and corporations of Buffalo, says a daily of that city, are at last awakening to the fact that the telephone service is about as bad as it can possibly be, and the charges for service inconsistently exorbitant, is shown by the action of the Buffalo Creek Railroad officials in their refusal to continue the use of the telephone in the trainmaster's office. General Agent E. F. Knibloe was interviewed on the subject recently in response to a question as to whether the abominable service was responsible for the company's action, he said: "It is not true that we are dispensing with Bell telephones on account of poor service. Although there have been many grounds of complaint on this account, that has not been the determining cause. The reason is that we consider it an extremely exorbitant rate. We were paying $180 a year for unlimited service on a single circuit with one instrument. At the expiration of the term on September 1st the telephone company canceled this contract and notified us of a new rate, which, upon the basis of last year's business of a little over 12,000 messages, would cost us a little more than $380."

The New England Telephone Company has announced that it will furnish telephones free to the residences of business men of Worcester, Mass., who have telephones at their offices for which they pay. The service will be on a six-party line and the offer is conditional in one respect. All residences to get the 'phones free must be near some existing line. No new line will be laid for the free service. 'Phones can be used free in residences until February 1, or a little over four months. After that the regular rate will be charged or the telephone taken out. The reduction there is also undoubtedly caused in part by the fact that the New England wants to jump in ahead of the independent company.

The work of constructing the Cortland, N. Y., Home Telephone Company's lines is progressing rapidly. The new company has already drawn over one hundred contracts for telephones, and has one hundred applications on hand for which contracts have not yet been made.

The Western Minnesota Telephone Company has issued bonds to the amount of $26,000, for the purpose of building a line to Glencoe, and for improving the lines and circuits between Glencoe and Granite Falls, Minn. The stockholders met in Minneapolis recently and decided upon the improvement. The company will have close connections with the Bell Company in the Twin Cities.

The People's Telephone Company, whose headquarters are at Knoxville, Tenn., is preparing to build a line to Williamsburg, Whitley County, Ky., and to other points in that section. This company may also put in an exchange at Williamsburg.

The New York & New Jersey Telephone Company, of Passaic, N. J., is now installed in its new building, at 143 Prospect street. The change of the central office from the old location to the new building was effected without any delay or inconvenience to the system, and the subscriber were not bothered in the least.

Free Telephone Proves a Success.

The experiment of educating the people up to the use of the telephone by giving them the use of an instrument free of expense for several months has proved a success in Augusta, Me. Now the number of telephone users in that city is greatly increased.

Several months ago the telephone company arrived at the conclusion that there was not enough telephones used in the city, and the only reason why more people were not using the convenience was that they did not appreciate its value. Accordingly it was determined to give everyone who wished the benefit of a free trial service. The linemen were busy for a long time putting in instruments with the result that miles of new wire were strung in the city.

In fact so many instruments were put in that it was necessary to do away with the custom which had been so long in vogue, that of calling for a subscriber by name. A new rule was made so that it is now necessary to call by numbers. With the innovation of the new rule the people soon began to see that by adhering strictly to the rules of the company they could get connection much quicker than under the old system. The result is that Augusta now has an enviable telephone system.

Of all those who had the instruments put in on trial but 16 have had them taken out after the free trial service. The scheme of educating the public to the new system has proven so successful that the same idea will be tried in other cities in that State. It is understood, therefore, that in a comparatively short time nearly every city in Maine will be given the privilege of trying the new free system for a time.

The new telephone line between Northwood and Northwood Narrows, N. H., was completed recently, connecting the trunk line of the New England Telephone Company from Exeter to Concord, N. H. Lines were in operation before from Exeter to Northwood and from the Narrows to Concord, and the line, besides connecting the two sections in one direct line, furnishes telephone service for the villages of Northwood Ridge and Northwood Center, which lie between.

The Progress Telephone & Telegraph Company of West Milton, O., has made application to the city authorities of Cincinnati for a franchise to construct and maintain a toll station in that city. The same was referred to the board of city affairs.

At a meeting at Columbia, Tenn., of the directors of the Citizens' Telephone Company, it was decided to combine the offices of president, secretary and treasurer, and the president, Dr. A. J. Porter, was elected to fill the position.

The village council of Two Harbors, Minn., has granted a fifty-year telephone franchise to Thomas Owens and his assigns. This is for the new system being built by the Duluth & Iron Range Railway.

A new telephone line has lately been established between West Liberty and Caney, Ky., a distance of ten miles. This line connects with the Morehead and West Liberty telephone line.

The Cumberland, Tenn., Telephone Company is extending a line from Jackson to connect Carroll, Medina and Humboldt. The line will prove a great convenience.

The Weed Abbey Telephone system is to be extended to Jericho, Vt., and it will connect at that point with the New England Telegraph & Telephone Company's lines.

Telephone connection has been made between New Market and Luray, Va. This connection gives Luray use of the entire Valley.

Weymouth, Mass., is to have a telephone exchange.

TELEPHONE INCORPORATIONS.

The Noble County Telephone Company, Albion, Ind., Capital stock, $15,000. T. A. Huston is the president of the board.

The Shiloh Mutual Telephone Company, Huntsville, Ill. Capital stock, $900. Incorporators: E. H. Grosclaude, J. E. Croxton and T. A. Wilson.

The Wayne & Pike Independent Telephone Company—to build a line in Pike, Wayne, Monroe and other counties in Pennsylvania. Capital stock, $6,000.

The Buchanan County Telephone & Telegraph Company, Independence, Ia.

The South Whitley Telephone Company, South Whitley, Ind. Capital stock, $3,000.

The Mineral City Home Telephone Company, Minera City, O. Capital stock, $12,000. Incorporators: G. J. Markley, T. E. Wilson, E. Vankirk, J. J. Kennedy and C. D. Juvinall.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Almonte, Ont.—A special election will be held October 20 to vote on the question of issuing $3,000 in bonds for erecting a municipal light plant.

Arcadia, Ind.—The harness factory and electric light plant here, owned by A. E. Goodykoontz were totally destroyed by a recent fire causing a loss of $15,000.

Atlanta, Ga.—The Atlanta Railway & Power Company, of which J. B. Burt is president, has been granted a franchise for the construction of an electric light plant.

Carlyle, Ill.—The city council will soon close the contract for an electric light plant for this city.

Carthage, N. Y.—The American Electric Light Company has leased water power of Dr. F. E. Robinson, and is now engaged in attaching a fifty-light arc dynamo to the wheels. This additional power will operate the arc lights, leaving the present power at the station for running the incandescents.

Chicago, Ill.—Dr. T. W. Goodspeed, secretary of the board of trustees of the University of Chicago says the new building for the University Press and Power & Lighting Plant will cost $250,000, and although the money has not yet been received for its construction, Dr. Harper is confident it will be erected next year.

Clinton, S. C.—Arrangements are being made and work will soon commence for the erection of an electric light plant. C. S. Moody can be addressed.

Florence, Ala.—E. J. O'Beirne, of Birmingham, has petitioned the city council for a franchise to build an electric light plant.

Flushing, N. Y.—Electric light trunk wires from this place will be extended to Elmhurst, and thence through Winfield and Woodside to Grand Street Ferry, Brooklyn.

Groton, Conn.—It is predicted by a business man here that it will not be many months before that part of Groton comprised in the Groton Fire District will be equipped with an electric lighting plant.

Henrietta, Tex.—The Henrietta Gin & Light Company, incorporated with $5,000 capital stock, contemplates the erection of an electric light plant.

Hickory, N. C.—The establishment of an electric light plant, or the granting of a franchise for such a plant, is talked of here.

Hutchinson, Minn.—This city will have electric lights in the near future. A company has been formed with a capital of $25,000.

Lake City, Fla.—A stock company is being organized to build an electric lighting plant here for the purpose of lighting the city.

Lake Providence, La.—This city is now asking bids on its authorized $17,500 of bonds for construction of an electric light plant, etc. Address G. M. Franklin, mayor.

Lancaster, Ky.—The electric plant and flouring mill have reduced operations on account of the scarcity of water.

Manchester, Ia.—At a special election the people of this city voted to grant a franchise for an electric light plant.

Manchester, Va.—The light committee will soon ask for bids for lighting the city. A. H. Meyer, chairman of committee.

Middleport, N. Y.—The question of municipal ownership of an electric light plant will be voted on by Middleport tax payers.

Minot, N. D.—The question of electric lights for this city is once more being agitated.

Mt. Morris, Ill.—The village authorities have received two applications for the privilege of putting in an electric light plant. C. H. Whitman and Ed. Thomas are the petitioners.

New York City.—The freight steamer L. Boyer, which plies between Flushing and this city, has been equipped with an electric light plant.

Norwalk, O.—An election will soon be called to vote on the proposition to issue $9,000 in bonds for the establishment of a municipal incandescent light plant.

Pen Argyl, Pa.—Owing to a water famine here the electric light plant was lately closed down.

Pine Bluff, Ark.—It is reported that W. H. Keyser and J. B. Bradley of Chicago, have lately been here in the interest of the proposed electric light plant.

Plymouth, Wis.—The common council lately accepted the bid of W. H. Wheeler of Chicago for putting in a system of electric lights and waterworks.

Richwood, O.—The electric light plant owned by Edward Schambo burned to the ground recently, entailing a loss of about $17,000.

Riverside, Cal.—The trustees have accepted the plans for the proposed electric light plant, and will receive bids for its erection until October 10.

South Elgin, Ill.—An electric light plant is to be establish in the Panton mill at this place for lighting the hotel, etc.

Story City, Ia.—This town is being canvassed for putting in electric lights, and it is claimed that the prospects are good.

Union Point, Ga.—The Union Manufacturing Company of this place wants bids on a 200-light 20 candle power dynamo.

Willimantic, Conn.—A recent resolution introduced by Alderman Taylor authorizing the construction of a municipal gas or electrical lighting plant was passed.

Windsor, Mo.—J. W. Carver has been awarded a contract to put in an electric light plant at this place.

STREET RAILWAYS.

Akron, O.—Hon. V. A. Taylor of Bedford lately appeared before the board of county commissioners and asked for a franchise for the proposed Bedford-Ravenna electric railway through Summit County.

Albion, Mich.—The city council at a recent meeting granted a 30-year franchise to the Kalamazoo Valley Electric Railway Company, represented by F. N. Rowley, of Kalamazoo.

Buffalo, N. Y.—Eastern capitalists have been interested in a company organized to build another electric road between this city and Rochester, provided the State Railroad Commission will permit.

Claremont, N. H.—Parties were recently here investigating the merits of the proposed electric railway.

Cleveland, O.—The Cleveland, Elyria & Western Electric Railway will extend its line to Medina, branching out at Berea.

Columbus, O.—D. L. Worthington and F. Johnson of the recently incorporated Columbus, Mt. Sterling & Columbus Electric Railway Company, are perfecting arrangements for their road to enter Franklin County and this city.

Concord, N. H.—The Boston & Maine Railroad has filed a petition with the State Supreme Court asking for authority to build an electric railroad from this city to Nashua.

Croswell, Mich.—The council has granted a franchise to the Detroit, Lake Huron & Lexington Railway Company to operate an electric railway within the village limits.

Emmett, Mich.—At a recent meeting of the common council a resolution was passed granting a franchise through this village to G. Lovejoy and others for an electric railway.

Exeter, N. H.—W. D. Lovell will apply at the next session of the Legislature for a charter for an electric railway between this place and New Market to be known as the Exeter & New Market Street Railway.

Florence, Col.—The permanent survey for the line of the Florence Electric Street Railway Company will be commenced within the next three weeks. H. A. Cook, J. Reed, H. Robinson, J. B. Meserve and A. B. McFall are interested.

Freehold, N. J.—There is a rumor that a company is forming for the purpose of building a trolley line from this place to the shore.

New Orleans, La.—The power house of the City Railway Company is in ruins. Major Baer, manager and receiver of said company, will have the system put in order at once.

New York City.—There is every likelihood now that a through trolley road from this city to New Haven will be built.

Penn Yan, N.Y.—The survey for the extension of the Penn Yan, Keuka Park & Branchport Electric Railway from Branchport to the Pulteney landing on Keuka Lake has been completed. The extension will cost $50,000.

Phoenixville, Pa.—A trolley line connecting Bridgeport and this place, passing through Valley Forge, will soon be started on the west bank of the Schuylkill.

Pine Bluff, Ark.—W. H. Keyser, a Chicago street railway promoter, intends operating an electric street railway here.

Sylvania, O.—Engineers have recently been at work surveying an electric railway route to this place.

Wapakoneta, O.—The council recently granted the final franchise to F. D. Carpenter, L. Coe and J. M. Mayor, capitalists of Cleveland, to construct and operate an electric street railway through this village.

MANUFACTURING.

Chicago, Ill.—Carlos S. Andrews, Eugene G. Fassett and Guy Brockway are interested in a concern recently formed here, known as the Station Equipment Company, which will manufacture electrical and mechanical machinery with a capital of $25,000.

Cincinnati, O.—The Motor Machine Company was organized here a short time ago by M. R. Conway, M. H. Wilson, T. M. Woods, Peter Renner and H. L. Gordon for the purpose of manufacturing engines, motors and all kinds of machinery.

Pittsburg, Pa.—The National Cable & Wire Company of this city, with a capital of $1,000,000, purchased the mower and reaper works in Latrobe, and is making preparations for an early start to manufacture electrical supplies.—The Shadowless Arc Light Company was recently formed here to manufacture and deal in shadowless arc lights, etc., on a capital of $15,000. W. C. Nixon of Pittsburg, J. J. Houlahan, C. Tepel and C. Koenig, all of Bennett, have an interest in the concern.

Portland, Me.—The Pawtucket Brass Foundry Company was recently organized here for the purpose of manufacturing and dealing in electric railroad supplies with brass and metal foundings with $50,000 capital stock. The officers are: President, Winfield S. Carpenter of Salem, Mass.; treasurer, James W. Sully, of Hyde Park.

San Francisco, Cal.—The Electrolysis-Proof Conduit Manufacturing Company was lately formed here with a capital of $200,000.

Washington, D. C.—F. C. Behrens, L. C. Brooks, C. C. Wheelan, C. H. Neely and R. W. Neely, all of this city, are interested in the Neely Electric Company, formed to manufacture, sell and deal in articles, appliances, etc., in the electrical line with a capital of $50,000.

COMPANY MATTERS.

Columbus, O.—The Columbus, Mt. Sterling & Washington Electric Railway Company was lately incorporated by C. P. West, W. R. Smith, F. Johnson and H. K. Stewart. The object is to construct and operate an electric railway, commencing at Washington Court House, and passing through Madison Mills, and Mt. Sterling, terminating in this city.

Pittsburg, Pa.—The Langton Electric Company suffered a considerable loss in a recent fire in this city.

POWER AND TRANSMISSION PLANTS.

Amsterdam, N. Y.—The Amsterdam & Hagaman Traction Company has purchased property and will erect a power station for the transmission of Schoharie Creek hydraulic power and will also establish a steam electrical power plant.

Peoria, Ill.—The Acme Harvester Company has lately contracted with the R. Lester Thayer Company of this city for a complete electrical power plant in its new works at South Bartonville. This plant will comprise 500 horse-power in generators and motors. The novel feature of the Acme plant is that it will be driven entirely by electricity.

Torrington, Conn.—It is reported that the E. A. Perkins Electrical Company of this place is negotiating for the purchase of the water privileges of Falls Village with a view to the development of a gigantic electrical power scheme which will affect all of northwestern Connecticut.

AUTOMOBILES.

Meriden, Conn.—W. W. Wheeler, president of the W. W. Wheeler Automobile Company of this place, has invented a motor for automobiles, and a company is being organized here for the manufacture of the same.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.– Oct 1.						
United Traction	100	$5,000,000	$5 000,000	1½ % Q.,	12	121½
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.– Oct 1:						
Allentown & Lehigh Val. Trac. Co	..	4,000,000	1,500,000	....	--	15
Bridgeport, Conn– Oct 1:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md– Oct 1:						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.– Oct 1:						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	145½	146
Brooklyn N. Y.– Oct 1:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	232	234
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	50½	50¾
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	322	325
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.– Oct 1:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.– Oct 1:						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.– Oct 1						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.– Oct 1						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	212	214
Chicago & South Side R. T. RR	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	3	30½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	81	81¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	13,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.............com	....	1,250,000	624,900	35 %	10⅛	11
Union Traction Co.............pref.	100	2,000,000	2,000,000	5 % S.	46¾	47
Cincinnati, Ohio.– Oct 1:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.– Oct 1:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.– Oct 1:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.– Oct a:						
City Railway Co.............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co..............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.– Oct 1:						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.– Oct 1						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.– Oct 1.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind– Oct 1.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.– Oct 1						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.– Oct 1:						
Louisville Ry................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry.................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.– Oct 1						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63¾	63⅞
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct.	136	137
Montreal, Canada.– Oct 1						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	267	297¾
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100⅞
Memphis Tenn.– Oct 1:						
Memphis Street Railway Co	100	500,000	500,000	....	25	--
New Haven, Conn.– Oct 1:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	--
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.– Oct 1						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR...........guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York– Oct 1:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	14 ⅞	148
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	32	36
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.– Oct 1:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60¾
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	16	19
Pittsburg, Pa.– Oct 1:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	8,000,000	‡8,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	†8,000,000	3,000,000	5 % A., June	..	..
United Traction Co.............com.	50	17,000,000	17,000,000	J. & J.	14	14¼
United Traction Co.............pref.	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Oct 1						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Oct 1						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Oct 2.						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Oct 1:						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Oct 1:						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Oct 1						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡583,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co............ $12½ pd	50	30,000 000	29,980,450	....	36⅞	37
cElectric Traction Co	50	....	8,297,920	....	--	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	--
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	--
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	95¼	96½
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	--
jContinental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	--
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	--
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	--
j17th & 19th Sts. Pass. Ry. guar	50	....	‖250,000	1½ % S., July, '98.	--	--
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	--
jUnion Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Oct 1						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Oct 1						
jReading Traction Co	--	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	138	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Oct 1						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	--	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	--	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	--	--
United Electric Ry.............com.	50	500,000	500,000	....	20	21
United Electric Ry.........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Aug.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	375,000	$2.50 share, '96.	50	--
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—Oct 1:						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Oct 1:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Oct 1						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Oct 1:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Oct 1:						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	§ 100¾	102¼
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Oct 1						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Oct 1:						
*Worcester Traction Co........com.	100	3,000,000	3,000,000	....	30	31½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Oct 1:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 1						
American Bell Tel Co	100	50,000,000	23,650,000	4½ % Q., Jan.	185	186
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	96	98
New England Telephone Co	--	10,394,600	10,304,600	$1.50 p. sh. Feb	123½	125
New York.—Oct 1						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	--	--
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	--	--
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	--
Western Union Telegraph Co	--	......	97,370,000	1¼ %, Q, Jan. '99.	78	78¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Oct 1:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	--
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	125
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 1:						
Fort Wayne Electric trust receipts	--	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	--
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	13⅞	135
T.-H. Elec. Co..T. Secur., Series C.	--	......	......	....	22	23
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	44	46
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Oct 1						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	-	--
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co.............com.	--	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	134⅞	135
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,0 00	A. & O.	110	125
Pittsburg, Pa—Oct 1						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Oct 1						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	50	60
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	55	65
Northern Elec. Light & Power Co.	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Oct 1						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	--	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	--
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120
Royal Elec. Co. (Montreal)	--	1,000,000	......	2% Q	‡193	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	133¾	135
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1, 96.	--	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Oct 1:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Oct 1:						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co..........com.	100	5,500,000	5,500,000	......	--	--
Worthington Pump Co...........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Oct 1						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	--	162
Welsbach Commercial Co.....com.	100	3,500,000	......	----	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1¼
Pittsburg, Pa.—Oct 1:						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Oct 1:						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	96
Billings & Spencer Co	25	......	....	....	82	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	55	58
Johns-Pratt Co	100	....	....	----	105	109
*Pratt & Whitney Co............com.	100	......	....	----	2	4
*Pratt & Whitney Co............pfd	100	....	......	----	40	50
Stillwell-Bierce Co..............com.	--	....	....	----	--	50
Stillwell-Bierce Co..............pfd.	--	....	....	2 % Sept 1,'99.	70	65
Shultz Belting Co	100	500,000	....	....	80	90
St. Charles Car Co	--	....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation— Oct 1, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*118	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127 1/8
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116 1/2	......

†Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation— Oct 1, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102 1/4
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74 3/4	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 7/8	
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104 1/8	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121 1/8
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102 1/8	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104 1/8	106
West End Street Ry.......Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101 3/4	2 1/4
†Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4 1/2s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry......1st mtg 4 1/2s,	4,040,000	4,040,000	1932	J. & J.	108 1/8	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96 1/8
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106 5/8	107
‖W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‖Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114 1/8	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103 1/8	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108 3/4	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121 1/8	122 1/8
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132 3/4	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106 1/2	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113 1/2	114 1/8
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105 1/2	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107 1/2
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102 1/8
Ft. Wayne & Belle Isle Ry....1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106 1/8

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s	100,000	34,000	1912	M & S	......	....

*With interest. ªUnlisted.

New Orleans La.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105 1/8	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107 1/8	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	10[illegible] 1/8
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109 1/8	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98 1/8	100 1/8
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100.000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200.000	1910	M. & S.	116 1/8	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108 1/8	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	......	110 1/8	112 1/8
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128 1/8
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation— Oct 1 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4 1/2s.	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry...................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	......	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J. & [illegible]	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col. tr. 4s.	29,785,000	29,724,876	1945	A. & O.	......	......
West End Passenger Ry.......1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111 1/2	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500.000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	....

Providence R. I.

Date of Quotation— Oct 1, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation— Oct 1, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101 1/8	10[illegible] 1/4
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101 1/8	102 1/2
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109 3/4
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	600 000	191	J& [illegible]	17	

*With interest.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*—Oct 1, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co. ‡Controlled by Union Depot RR. Co. ¶Controlled by Lindell RR. Co. ‖$200,000 in escrow to retire 1st & 2d mtg. §$600,000 in escrow. ††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry......1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C. *Date of Quotation*—Oct 1, 1900						
Belt Ry. Co.......................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry...........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous. *Date of Quotation*—Oct 1, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	.. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Cross't'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N. J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry.............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds. ‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co. ¶$760,000 in escrow to retire bonds of C. St. RR. Co. ‖$87,000 in treasury. §$960,000 res'ved to redeem prior liens. ††$620,000 in escrow.						
					*With int'rest	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Oct 1 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	....		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—Oct 1, 1900						
Allegheny County Light Co.................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Oct 1, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 1, 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co.................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 1, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co...............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127
Unlisted †Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16⅜@16½c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

William L. Elkins denies the story that he is associated with Charles T. Yerkes in the London railway scheme.

To complete the authorized issue, the Bell Telephone Company will issue $1,000,000 additional capital stock.

The Mexican Telegraph Company has declared a quarterly dividend of 2½ per cent., payable October 13. Books close October 6 and reopen October 15.

J. Levering Jones of Philadelphia, and John B. Stauffer, of New York, have been added to the board of directors of the Erie Telegraph & Telephone Company.

The Anaconda Copper Mining Company has declared a dividend of $1.25 per share and 75 cents extra, payable October 27. Books close October 10 and reopen October 28.

The Erie Telegraph & Telephone Company has declared the regular quarterly dividend of 1½ per cent., payable October 8. Books closed September 29 and reopen October 8.

The Parrot Silver & Copper Mining Company has declared the regular quarterly dividend of $1.50 per share, payable October 29. Books close October 13 and reopen October 30.

The Wisconsin Telephone Company has declared the regular quarterly dividend of 1½ per cent., payable October 8. Books closed September 29 and reopen October 8.

The Michigan Telephone Company has declared the regular quarterly dividend of 1½ per cent., payable October 8. Books closed September 29 and reopen October 8.

The Central & South American Telegraph Company has declared a quarterly dividend of 1½ per cent., payable October 6. Books closed September 29 and reopen October 8.

The latest quotations for some of the new industrial stocks, not given elsewhere, are: Electric Boat, 13@17; New York Electric Vehicle Transportation, 6½@7½; New England Transportation, 3@3½.

Advices from Montgomery, Ala., state that consolidation has been effected between the local street railway companies and electric companies. It will be bonded for $2,100,000 and its capital stock will be about $3,000,000.

The inability of the directors of the Chicago Union Traction Company to obtain a quorum on Friday last necessitated a postponement of action on the dividend and the election of officers until October 4.

The New York Rapid Transit Commission on September 27 by a unanimous vote decided to tunnel the East River and connect the two boroughs by an underground road that shall act as a feeder of the main subway system in Manhattan and the Bronx.

At intervals for several years past the directorate of the Toronto Electric Street Railway has tried to buy out the Metropolitan Electric Railway, which also operates in the city of Toronto and environs. Negotiations are now under way with good prospects of a successful issue.

The annual meeting of the Standard Light & Power Company of Montreal, Que., was held in that city on September 26. The annual report showed the company to be in a very prosperous condition, having declared for the year an 8 per cent. dividend, and after providing for unforeseen contingencies, were able to add to profit and loss account over $10,000.

A cable dispatch from London says that Charles T. Yerkes has closed his deal for the purchase of the franchise of an underground railway running from Charing Cross to North London, and he has been elected chairman of the company which will construct the road. The English company now passes into American hands. Mr. Yerkes paid $500,000 to cover the capital sunk by the English promoters of the company. The resignations of the original board were simultaneously recorded and a new board was selected. The new road will be equipped with all the latest improvements in electrical transit.

The fight between Mr. Keene and the Whitney-Widener-Elkins syndicate over Brooklyn Rapid Transit promises to be as interesting as their contest over Third Avenue last year. It is generally believed that Mr. Keene lost heavily in the Third Avenue collapse. Mr. Keene, it is said, is now trying to prevent the Metropolitan syndicate from playing very much the same game in Brooklyn Rapid Transit. It is said that the Metropolitan interests are trying to force the stock down to 35, buy it in at that price and reorganize the company on the basis of one share of new stock for two of the old. Keene is trying to force the company to pay more than 50 for its stock. There is said to be a big short interest in the stock and it may be bid up suddenly at any time.

Steam railroads in New England, says the Boston "News Bureau," are gradually entering the electric railway field as a counter move to offset electric road competition and for the purpose of adding "feeders" to their systems. The New Haven Railroad was the first to branch out in this direction and it has acquired considerable electric road mileage in pursuance of this policy. The Boston and Maine has likewise entered the electric field. It has constructed at Portsmouth, N. H., an electric road 16 miles in length, operating through the streets of that city and through outlying towns. The Boston and Maine has now asked for authority to build an electric road between Nashua and Concord, N. H. President Lucius Tuttle of the Boston and Maine says: "We have been operating an electric road at Portsmouth, N. H., for about two years with good results and if granted authority will probably build between Concord and Nashua. In New Hampshire we have the right to build electric branches, and we are taking advantage of that right, as fast as the necessity arises, by building feeders for our steam road."

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ELECTRICITY.

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EDITORIAL NOTES.

The Disposal of Town Refuse.

A paper of great practical importance on the subject of the disposal of town refuse, was read by Mr. McTaggart a few weeks ago in England, at the Bradford meeting of the British Association for the Advancement of Science. Among other things Mr. McTaggart pointed out that although the varying nature of the refuse, and the consequent variation in the calorific value rendered it, to say the least of it, impolitic to combine refuse destruction and electric lighting in one plant, it is quite within the range of practicability to utilize the residuum after incineration for the manufacture of bricks and tiles, engine foundations, sand, and so on, at such a cost as to make the operations a financial success. This he has done at the Bradford works, where a large number of destructors have been doing service for many years past, and more are now being added. The experience that Mr. McTaggart has, influences his remarks that the two operations of electric lighting and refuse burning should be separate and absolutely distinct the one from the other. That will prevent any mutual handicapping, and will tend to the development and up-to-dateness of both. The refuse collected at Bradford and other towns has shown that its varying nature at different times in the week renders it necessary if a definite large amount of electrical energy is to be available when required, that coal would have to be called in to assist the refuse or possibly to take its place. So far as the Bradford undertaking is concerned the waste gases are used in connection with the electric lighting of the works themselves and the roads adjoining, but nothing more. What they are doing is to develop the destructor as a destructor on right lines, afterwards making profitable use of the remaining clinker for the manufacture of bricks and other things at so low a cost that the selling prices are greatly below the current market prices for these materials. Mr. McTaggart's opinion is that in this way more satisfactory results will be obtained than by the mere generation of electricity by the aid of the waste furnace gases. As Mr. George Watson says, a destructor is not by any means an automatic machine. It requires a man of skill at the helm.

Pacific Cables.

One of the first questions to demand the attention of Congress at its coming session must be, by all the exigencies of war and peace, the trans-Pacific cable; certainly no one in favor of the bill could have possibly planned circumstances that would more forcibly have made the necessity for it clear to the public and private mind than those that have transpired during the present summer when this country has been placed diplomatically and commercially at the mercy of the world in general.

The question of the practicability of such a line has been clearly demonstrated, and it is understood that Rear-Admiral R. B. Bradford, in his forthcoming report, will recommend that Congress be urged to make an appropriation for a cable across the Pacific. A survey of the Midway Islands has been completed by the Iroquois, and there is no doubt of the value of the islands as a site for a cable station. The bed of the ocean has been completely surveyed from San Francisco via Honolulu, Midway Islands and Guam, to the Philippines, and from Guam to Yokohama. It is certain that unless we take some action in the immediate future Great Britain will step in and build a line to extend from the western coast of British North America through the Pacific and down to the Australasias. In fact, a recent issue of the London "Electrical Review" contains the specification for the proposed Pacific cable which is divided into three sections. The first is that of the Vancouver (Port San Juan)—Fanning Island cable, which has a total length of 3,653.5 nautical miles, all of this being main cable with the exception of 64½ nautical miles of heavy shore end, heavy intermediate and light intermediate. The conductor will be composed of a central copper wire surrounded by smaller ones, weighing altogether 600 lbs. per nautical mile, and having a resistance of not more than 2.03 B.A. ohms at a temperature of 75° F. It is to be insulated with three or more coatings of gutta-percha weighing 340 lbs. per nautical mile.

The dielectric, after 1 minute's electrification, is not to have a resistance of less than 500, nor more than 1,500 megohms per nautical mile at 75° F., and its average inductive capacity is not to exceed 0.440 microfarad per nautical mile. The shore end and intermediate core is to be sheathed with brass tape, but the core for the main cable is not so protected.

The second contract is for the Fanning

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Island—Fiji (Suva), length totaling 2,181 nautical miles, composed of 8 miles heavy shore end, heavy intermediate and light intermediate; 649 miles of heavy deep sea, and 1,524 miles of light deep sea cable.

The conductor weighs 220 lbs. per nautical mile, and is composed of a central copper wire surrounded by smaller ones, having a resistance at the usual temperature adopted in cable testing of not more than 5.54 B.A. ohms.

The gutta-percha covering weighs 180 lbs. per mile, insulation resistance as in the previous case, with an inductive capacity not exceeding 0.385 microfarad per mile. The short lengths are brass sheathed as before.

The third contract comprises the following sections: (a) Fiji (Suva)—Norfolk Island (Sydney Bay); (b) Norfolk Island (Sydney Bay)—Queensland (Moreton Bay); (c) Norfolk Island Sydney Bay) New Zealand.

(a) has a total length of 1,019 miles, all but 50 being deep sea. (b) a length of 906 miles, of which 852 miles are deep sea. (c) 513 miles, 440 being deep sea, the grand total under this contract amounting to 2,438 nautical miles.

The core of all three sections is 130 lbs. copper and 130 lbs. gutta-percha per mile, the conductor consisting of a strand of seven copper wires. The insulation resistance is to be as in the two previous contracts, and the inductive capacity shall not exceed 0.355 microfarad.

One drawback to the speedy construction of an American cable would seem to be the conflict which has been going on as to whether the proposed cable shall be laid and operated by the Government or by a private corporation. Generally speaking, in this country municipal or Governmental control of such an enterprise is not to be recommended, but rather than have this important matter held in abeyance it would seem even preferable to have the cable laid by the Navy, even though it were ultimately to be operated by the Post Office Department.

* * *

An Automobile Show for Washington.

It has been amply demonstrated that there is no factor so potent or so effective in the work of popularizing the automobile as to show the public this type of vehicle in its finished state, and to have them see for themselves the degree of perfection that has been attained by the automobile manufacturers of this country. Believing this can best be done through an exhibition, a number of prominent business men of Washington, D. C., have arranged to hold a show in that city during the week of December 10, which will be known as the National Automobile and Sportsman's Exhibition. Convention Hall, a massive building without a single pillar and and having a floor space of 36,000 square feet, has been secured for the show, and will be divided in such a manner as to provide for 110 spaces. A track 16 feet wide and an eighth of a mile in length will also be constructed in the building, where practical demonstrations of the efficiency of the various vehicles exhibited can be made. This will be the first automobile show to be held at the National capital, and no expense will be spared in making it an unqualified success.

The public of Washington is gradually awakening to the practicability of the self-propelled vehicle, and the promoters of the proposed exhibition believe that no better opportunity of reaching a large class of interested people can be had than a good representation at the forthcoming exhibition. Congress will be in session at the time, and the Washington season will be in full swing. The officers of the exhibition are as follows: Edward Reynolds, manager; W. J. Foss, treasurer, and Rudolph Jose, secretary.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A NEW dynamo of 500 horse-power has lately been put in at the State penitentiary near Nashville, Tenn.. Electricity furnishes the motive power in all the factories and about the prison.

ELECTRICITY has proven the woman's friend at St. Etienne, France, where it now runs 5,369 ribbon looms in 2,380 weaving shops. The looms were formerly worked by hand, and could be operated only by men, but under the new conditions women can readily do the work.

THE new building of the Ottawa Carbide Company of Ottawa, Ont., contains some of the finest machinery on the American Continent, and is capable of producing sufficient carbide to supply a very large share of the needs of the world in this commodity. To describe the interior of the big building is at present impossible as no outsider is yet allowed within its walls for the reason that the machinery comprises, it is said, several valuable improvements which have not yet been patented, and new processes that are alone known to three or four principals. It is intended to run the works continuously night and day, having three shifts of workmen, so that a very large output of carbide seems assured. The construction of these works is estimated to have cost over $500,000.

THE Apple River electric power was turned on the St. Paul, Minn., lighting system last week. The company now has ten converters in place in the basement of the new power house, and others will be installed. These converters will convert the alternating current into a continuous current, suitable for domestic use in St. Paul.

IT is announced that direct telephonic communication will be established between London and Brussels at the beginning of next year at the charge of $2 for three minutes' conversation.

ACCORDING to a consular report, the three large German electrical companies, Messrs. Siemens & Halske, the Union, and the Allgemeine Electricitäts Gesellschaft, have founded a company bearing the title "Abwarme Kraftmaschinen Gesellschaft" for the exploitation of patents to utilize the waste of exhaust steam and condensing water. The report states that should the invention fulfill the expectations of its projectors, especially with regard to machines of large dimensions now in course of construction, "it will lead to a most important, in fact epoch-making, progress in the economy of central power plants."

THE New Haven, Conn., and Derby Road will be equipped with electricity within the coming year, and a start made to build an extensive electric railway system connecting New Haven, Derby and Bridgeport. There is now in process of construction on Long Wharf in New Haven, an electric plant, which will be capable of producing 3,000 horse power. The plant for the present will be operated simply to light the local offices and station building, but it is being fitted up with apparatus to generate and conduct electric power, and this will be turned into the Derby Road and used as the operating power for that line. The third rail will be used in preference to the overhead trolley, and the steam locomotives taken off and replaced by motor cars.

THE power house belonging to the Brooklyn Rapid Transit Company, located at Third avenue and Second street, in Brooklyn, was badly damaged by fire on the morning of October 3. The damage, it is said, will amount to about $35,000, which loss, however, is covered by insurance.

A CABLE dispatch from London to the N. Y. "Sun" states that on October 6, Marconi successfully transmitted a message by wireless telegraphy from Boulogne, France, to Dovercourt, a distance of sixty miles. The customary mode of receiving and transmitting the message, by means of vertical wires, was abandoned, the dispatch being received on a cylinder only four feet in height.

ELECTRIC busses were lately put in operation at Wilkesbarre, Pa. They run on regular routes, fifteen minutes apart, and the fare is five cents a trip.

A STRONG effort is to be made to get for Indianapolis, Ind., the headquarters of the International Brotherhood of Electrical Workers, now located at Rochester, N. Y., and although the next convention will not be held for over a year, the members of local Union No. 10 have already started the campaign by soliciting the aid and votes of the other cities. President Wheeler is much in favor of the establishment of headquarters in Indianapolis on account of its central location and its railroad facilities.

PEORIA, Ill., will have the seventh convention of the International Association of Municipal Electricians, due to the efforts of City Electrician Michaels, who returned from the convention of the Association held at Pittsburg a short time ago, at which the matter came up for discussion, and has received the personal promise of most of the delegates that Peoria shall have the meeting of 1902.

THE Mikado's palace in Japan is connected by telephone with all the Government offices in the land; the electric light has been established there, and, to the immense satisfaction of the Japanese, there are dynamos at work in the imperial house that were made by Japanese workmen.

IN a paper read before the Paris Electrical Congress, Mr. Kellar gave a good general classification of the electric furnaces employed at the present time. There are three classes—arc furnaces, resistance furnaces, and incandescent furnaces. In the first class the heat is generated by a voltaic arc. In the resistance type the heat is furnished by the passage of the current through imperfectly conducting material, and in the incandescent furnace the material to be acted on is not initially conductive and a special conducting layer is required to start the current. The temperatures

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obtained in the electric furnace are said to be in excess of 3,000 degrees C., and are the highest yet attainable artificially.

The Cooper Union schools of this city opened last week with full attendance in all the departments. Extensive changes and improvements have been made, one of which is the enlargement of the chemical laboratory, which will now accommodate 300 students, and the establishment of the day schools in chemical analysis, civil, mechanical and electrical engineering. The physical laboratory is equipped with steam, gas and electric motors, and with every variety of electrical appliance.

IT is stated that negotiations are about to be reopened between the Navy Department and Mr. Marconi, the inventor of the wireless telegraphy system, for installing the system on board ships of the United States Navy. The previous negotiations came to an end because the department regarded the price named by Mr. Mareoni for the use of his system as excessive.

GROUND was first broken for the great electric power tunnel plant at Niagara Falls, N. Y., October 4, 1890. During the first decade there has been a far more wonderful development than even the most sanguine anticipated. Factory after factory has been erected, plant after plant has come to the Falls to become a part of the new industrial growth made possible by the wonderful enterprise of the Niagara Falls Power Company. Buffalo, Lockport and the Tonawandas are to-day sharing the benefits of the Niagara power development and the fame of the installation has gone around the world. Men from the East, West, North and South have traveled across country to look upon the wonderful dynamos, and they have traveled on cars forced by power from this installation. Ten years ago there was expectation. To-day there is realization, and this realization is so rich in its wonders, in its accomplishments that it must of necessity cause blushes on the faces of those who a decade ago felt that the stupendous project of the Niagara Falls Power Company was not likely to mature in all the ripeness and richness predicted.

THE Colorado Electric Company, with head offices at Colorado Springs, Col., is at present very active in aiding the vast development of the gold camp at Cripple Creek. It is constantly supplying mines with electric hoists, and it has recently received more applications for electric hoists from Cripple Creek companies than in several weeks before. It is now having the line surveyed to carry the power to Beacon Hill, and has just decided to put up poles and wires to accommodate the many mines which are soliciting the power on Squaw Mountain.

THE following abstract, which appears in the "Journal" of the Chemical Society, is of a paper contributed by Mr. S. Skinner to the "Proceedings" of the Cambridge Philological Society, says the "Electrical Engineer," London. The abstract is as follows: "When a solution of potassium permanganate is electrolyzed with a carbon anode, 77.86 per cent. of the gas liberated at the anode consists of carbon dioxide, the rest being carbon monoxide and oxygen. The total volume of gas liberated is nearly the same as the volume of oxygen liberated by the same current in a dilute sulphuric acid voltameter. The permanganate ion persists in solution even although a quantity of electricity more than sufficient for its complete decomposition is passed through the cell. The author finds the electrochemical equivalent of carbon to be three times that of hydrogen. A cell may be constructed with a carbon rod in potassium permanganate, and a lead peroxide plate in dilute sulphuric acid, the two electrolytes being separated by a porous pot. The emf. is 0.33 volt, and acts externally from the lead peroxide to the carbon. In this self-acting system carbon is consumed at the ordinary temperature.

THAT electricity is apparently becoming popular in the South American countries as a motive power for railroads there is no doubt. The Chilian Electric Tramway & Light Company, at Valparaiso, which has some forty-two miles of horse-car lines, is to shortly convert them into electrical. La Capital Tramways Company, of Buenos Ayres, Argentina, has acquired the systems of the New and Grand National Tramways Companies, and intends to convert both of these systems into electric traction. It is well to bear in mind that La Capital Company has already a great deal of American material in use on its existing lines, and, under equal conditions, they give American manufacturers the preference.

ACCORDING to reports current among automobilists, a number of record runs will be made this fall between Newport, R. I., and this city. W. K. Vanderbilt, Jr., it is said, will make another attempt, while J. Dunbar Wright will also undertake the run.

AN association has been formed for the protection of the water, electric light and gas companies of Arkansas, Iowa, Kansas, Missouri, Nebraska and Oklahoma. It is called the Water and Light Bureau of Information, and has its principal office in Kansas City, Mo. Mr. George M. Myers, of that city, has been selected as general manager of the association. Mr. Myers is personally interested in and manager of a large number of water and light companies, and has had experience in the operation of such companies.

THE Brooklyn Navy Yard electric light and power wires are all to be placed underground. The conduits to carry these wires between the new power station and the old plant controlled by the department of construction are now being laid. The new shops are being wired and equipped for electric power. The million-dollar machine shop which is in course of construction for the steam engineering department, will have many machines with individual motors. This is also true of many of the machines in the pattern shop just completed. All belting is done away with and the machines are run only when needed.

The Nature of Alloys.

Amongst the papers read at the recent meeting of the British Association at Bradford was one by Mr. F. H. Neville on the "Nature of Alloys." The paper, says the London "Electrical Engineer," contained an abstract of the report of the British Association Committee on the subject. Thus it was stated that most students believed that certain definite chemical compounds existed in alloys. To prove this, however, certain means must be adopted to abstract the particular compounds. Ordinary chemical means of isolation were of no use under the circumstances. Fractional solution was effective in some cases, and by means of it several distinct metal compounds had been isolated from alloys, such as platinum-tin, copper-tin, zinc-copper, and other compounds. Another method was by observation of the "freezing point"; the molten mixture was cooled down slowly, and the temperature noted at which solid matter began to separate from the liquid. This varied with the proportion of the constituents, and by making many observations with varying proportions, a curve could be obtained of these solidifying temperatures, any irregularity pointing to the formation of something other than a mere mixture. By this means many interesting facts had been indicated which had subsequently been rendered evident by examination under the microscope. Valuable and interesting results had been thus obtained, both in this country and abroad.

A remarkable instance of peculiarity was exhibited by mixtures of aluminum and antimony when all the mixtures froze at a higher point than either of the components, and showed two irregularities indicative of two distinct compounds. In these mixtures it appeared that the component that predominated to a considerable extent acted as a solvent to the compound formed with the other component; but as the proportion of the other component was increased the conditions became reversed.

A Young Electrician Killed.

John O. Donohue, a young Canadian electrician, who was pursuing a course in electrical engineering at the General Electric Works at Schenectady, N. Y., was instantly killed recently in the testing department of the company's works. At the time of the accident he was engaged in testing a 400 horse power generator. The power was shut off for a time while some mechanical alterations were made, and during this time Donohue fell asleep on some belting. The belt upon which he fell asleep transferred power from the large motor to the generator which he was testing. While in this dangerous position the lever was turned by one of the mechanics at work in the shop. The body was carried to a fly wheel where it was badly crushed. No blame is attached to any one in the matter, as no one could foresee the possibility of any one being asleep on the belting.

Educational.

It is encouraging to note what a prominent factor the night-schools are growing to be in the lives of thousands of young men who have, for various reasons, been deprived of the privileges of a complete day-school education. Noteworthy among these institutions offering such opportunities is the West Side Young Men's Christian Association of New York City (318 West 57th street). Here the very best instruction (both elementary and advanced) is given in science, arts, modern languages, technical instruction, mathematics, music and commercial branches. Especially strong is the work that is being done in drawing and the other technical subjects. Very carefully planned courses are offered in simple and advanced mechanical drawing, architectural work, also free hand and water-color instruction. The West Side Association is an aggressive institution and is anxious to place the very best instruction that is to be had within the reach of all.

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THE USE OF THE DYNAMO AND STORAGE BATTERY IN TELEGRAPH OFFICES.*

BY W. J. CAMP,

Superi.tendent C. P. R. Telegraphs.

Previous to 1870, acid batteries of various kinds were used for main telegraph circuits, and the Daniel form of blue-stone battery for the locals, or sounder circuits. Between 1870 and 1874, what is known as the "gravity battery" was brought into general use. This battery is a modification of the Daniel cell, but the sulphate of zinc and sulphate of copper solutions are kept separate by the difference in their specific gravity instead of by means of a porous cup. This form of battery is very constant and requires but little attention as compared with the acid. To obtain the best results not more than two or three wires should be worked from each bank, although frequently ten or more are thrown on one bank of battery. When this is the case the results are unsatisfactory, particularly during wet weather, and when wires of different lengths are combined together. A separate bank is required for each duplex or quadruplex set, and also a local battery for each sounder circuit. It is true that, as each cell gives out about one volt emf., the exact power required for each multiple circuit or local can be very accurately adjusted by adding to, or taking off from the number of cells; and on this account, a great many chief operators raised ojections to dynamo currents. However, even this advantage has been compensated for.

While the change from acid to gravity batteries effected a great economy in maintenance, and improvement in the working of the telegraph wires, a much greater stride has been made by the introduction of the dynamo and storage battery in telegraphic work. I will deal first with main lines, and then with local, or sounder and transmitter circuits.

About 1880 dynamos were introduced by the Western Union Telegraph Company at New York for supplying current to the single working wires. The means for doing this are comparatively simple. Two dynamos are used, each of a voltage high enough for the longest wires; the positive pole of one and the negative pole of the other dynamo are earthed, and the opposite poles connected to two buss wires. The various single working wires are connected to these buss wires, according to the polarity required, through an artificial resistance for each wire. The Western Union in the United States, and both companies in Canada use incandescent electric lamps for these resistances. The Postal Company in the United States uses german silver wire wound on tin tubes, so designed that, should any heating take place, it is counteracted by a current of cold air which passes through the tube. Additional resistances were inserted on the shorter wires to make all lines approximately of the same electrical length. These resistances were usually of fine german silver wire wound on the handle of a wedge which was inserted with the instrument wedge in the spring-jack of the switch. It has been found much more satisfactory, however, to have several dynamos giving different voltages, and the use of the resistance wedges abandoned.

The next step was to apply dynamo power to duplex wires. For many years back the polar duplex has been used all over America. When using the gravity battery the transmitter (pole changer) was arranged to reverse the poles of a bank of battery from earth to line and vice-versa. This pole changer required very accurate adjustment in order to reduce the time of reversals to a minimum; the least break in the circuit, or short-circuiting of the battery, being liable to affect the signals at either or both terminals of the line.

For dynamo power the earth connection is omitted in the pole-changer; the armature is connected to the line circuit, the front contact to the negative buss wire, the back contact to the positive, and resistances of 600 or more ohms inserted ahead of each buss wire to prevent arcing at the contacts of the pole changer.

Then came the application of the system to quadruplex circuits. Great difficulties had to be overcome to effect this. Two entirely different systems are in general use, one by the Western Union and Great North Western Telegraph Companies and the other by the Postal Telegraph Company. The Canadian Pacific Company uses the Western Union system at Toronto and Montreal and the Postal system at other points.

A few general remarks with reference to the duplex and quadruplex as worked with gravity batteries may be of interest at this point to those who have not read up the subject.

Duplex is a system by which two operators can transmit simultaneously in opposite directions. This is attained by winding the receiving relays with two coils of wire in opposite directions, one winding being connected to the line, and the other to a set of resistance coils and condensers which are so adjusted that the electrical length and static capacity are the same as the real line. The home power divides equally, half passing around the core in one direction to the real line, and half in the opposite direction to the artificial line, the result being that the core is not magnetized by it, and it is not susceptible to the home power. As the power coming over the line from the distant station only passes through one of the coils, and there is none coming in from the artificial line to counteract it, the core is affected by any change in power at the distant station. The receiver is a polarized relay whose armature closes the sounder when moved in one direction, and opens it when moved in the other. The transmitter is an instrument worked by an ordinary telegraph key and local circuit. It is so arranged that, when the key is depressed the negative pole is connected to the line, and positive when the key is opened.

Quadruplex is a system by which two operators can transmit one way simultaneously with two operators transmitting in the opposite direction, i.e., four messages can be sent simultaneously on one wire, two in each direction. The arrangement by which two operators transmit in the same direction may be briefly described thus:

A transmits by reversing the polarity to line the same as in duplex, and C receives by means of a polarized relay. B transmits by increasing and decreasing the same power which A is reversing; D receives from him by means of a neutral relay which responds to power of any direction if it is strong enough. The retractile spring of the armature is adjusted so that the weaker power does not move the armature, but when the full power is on the spring is overcome. By double winding both receivers at each end, as explained for the duplex, we obtain "two circuits in the opposite direction."

In order to obtain satisfactory work all resistances must be maintained at their relative length. When using gravity battery transmitter "B" simply adds more cells to "A's" battery, or takes them off when closing or opening his key. A resistance coil to compensate for the internal resistance of the extra battery is automatically cut out, or inserted, thus maintaining the total electrical length of the line from earth to earth

The Western Union system of transmission is shown in Fig. 1. The resistance from A to

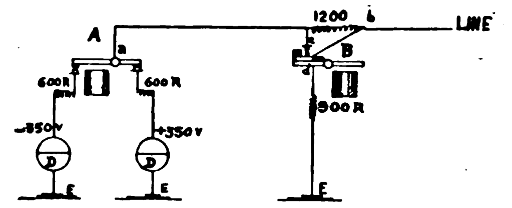

Fig. 1.

earth through the dynamo circuits is 600 ohms no mattter which position transmitter A is in. When transmitter B is closed the resistance from b to earth is 600 ohms because the 1,200 ohms coil is shunted out by contacts c and the leak of 900 ohms is disconnected at d. The full power of either the negative or positive dynamo goes to line through one of the internal resistances of 600 ohms. When the transmitter B is opened the 1,200 ohm coil is inserted between b and c making the total resistance between b and earth via the dynamo of 1,800 ohms. There is also another route to earth, through the leak of 900 ohms. The joint resistance of these two routes is 600 ohms, as found

$$\text{by the formula } \frac{A \times B}{A + B} \text{ or } \frac{(1{,}200 + 600) \times 900}{(1{,}200 + 600) + 900} = 600$$

thus maintaining the same resistance between b and earth for all changes.

The amount of power passing b to line is however reduced to $\frac{1}{3}$ when transmitter B is open, first, on account of the added resistance of 1,200 ohms, and second, on account of the leak of 900 ohms. In other words when transmitter B is closed the power passing to line is three times as much as when B is open.

By changing the added resistance to 1,800 and the leak to 800 ohms the difference is then as 4 to 1 and the internal resistance still maintained at 600 ohms.

The principle of the Postal system of quadruplex transmission is shown in Fig. 2. For

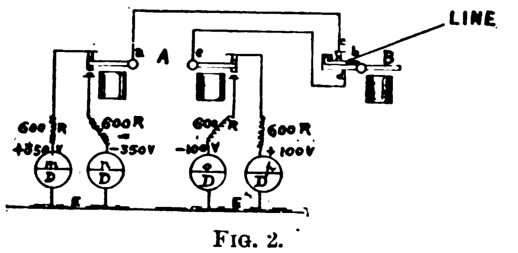

Fig. 2.

the purpose of explanation, transmitter A is shown as two separate instruments worked simultaneously by one key. The one on the left gives 350 volts to the line and the one on the right 100 volts. Opening of the key connects either m or p to line according to the position of transmitter B; closing of key connects either n or o; or opening A gives positive pole and closing gives negative. Closing transmitter B connects line through b, c, a, to dynamos m or n (350 volts) according to the position of transmitter A; opening transmitter B connects line through b, d, e, with dynamos o or p (100 volts). Thus B transmits by increasing

*Paper read before the Canadian Electrical Association, held at Kingston, Aug. 29, 1900.

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or decreasing the power sent out by A. As the resistances in each of the four leads to the dynamos are the same (600 to 1,000 ohms) the internal resistance from b to earth is constant.

It is hardly within the scope of this paper to compare one system with the other. It is sufficient to state that either system has certain advantages and both give excellent results. The receiving instruments are the same as for gravity battery.

The dynamos are made of sufficient voltage for the longest quadruplex circuit from the office. When the same machines are used on comparatively short circuits a resistance coil of 1,000, or more, ohms is inserted between b and the receivers.

We now come to the locals. For ordinary sounder circuits a very simple plan is to use a dynamo of 6 volts and connect all sounders in multiple. The sounders are wound to 20 ohms resistance; but in nearly every office where dynamos are used there are also quadruplex or duplex sets, and it is often necessary to connect these as repeaters. There are a number of systems, but I will only decribe the one in use by the C. P. R. This is, I think, the most simple yet designed. It is shown in Fig. 3. Each half quadruplex or half

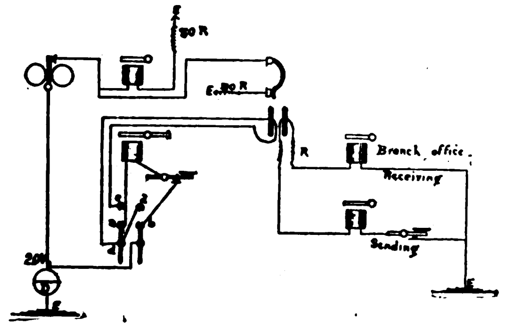

Fig. 3.

repeater is treated as a duplex set. All sounders and transmitters are wound to 20 ohms and, by resistance coils, each local circuit is brought up to 100 ohms. The dynamo gives from 20 to 25 volts. The former is found to be sufficient. The figure shows the instruments in a normal position, except that the transmitter wedge should be inserted in a spring jack. Starting from the dynamo the receiving circuit passes through the relay contacts, 20 ohm sounder, 80 ohm coil, earth to dynamo, the leg through jack being open at c. The sending circuit is from dynamo through switch b, key, 20 ohm transmitter, switch a, d, wedge, back contact of jack, 80 ohm coil, earth to dynamo.

To work as repeaters the wedges of the two sets are exchanged, that of No. 1 set, being inserted in No. 2 jack and No. 2 wedge in No. 1 jack; the table switches a and b on each set are reversed.

The circuit then is, earth, dynamo, relay contacts, 20 ohm sounder, 80 ohm coil, earth; also from relay contact to top of jack, front of wedge of No. 2 set, c, a, transmitter, key, b, d, back of wedge, coil and earth. The circuits from No. 2 set are the same. Any break in contacts of relay opens its sounder and also the transmitter of the other set. Thus signals received from the line on No. 1 set are automatically retransmitted over the line connected to No. 2 set, and vice-versa.

To extend the locals of a duplex to a branch office, the loop wedge is inserted in the spring jack on top of the transmitter wedge; switch a is turned up, switch b down. Circuits are then as follows: Receiving side, dynamo, relay, sounder, coil, earth; with leg from relay contacts to top of jack, front of wedge, coil, line, branch receiver and earth. The resistance coil is adjusted so as to make the circuit from wedge to branch earth total 100 ohms including branch sounder.

Sending side, dynamo, b, key, transmitter, a, c, front of transmitter wedge, back of loop wedge, coil, line, branch sounder, key and earth. The resistance from wedge to distant earth is 80 ohms including sounder. On this circuit the resistance of the transmitter is added making a total of 100 ohms.

Sometimes the dynamos are operated from a common shaft driven by an electric motor or other power, but the plan most generally adopted is to use motor generators, each machine working independently. In order to be reasonably certain of a continuous supply of power spare leads are run to different power stations, and spare machines are also kept in readiness, so that not more than a minute or so is lost at any time.

In cities where continuous power cannot be obtained from two different stations, storage batteries are now largely used. Generally speaking, the wiring of a telegraph office, from the discharge leads of a storage battery to the instruments, etc., is the same as for dynamos, but extra switches have to be used for connecting the various banks of battery with the charging or discharging circuits. Various devices are used, but as I consider the C.P.R. system the most flexible, I will describe it only.

At Vancouver the Winnipeg street railway power is transformed by two motor generators; one reducing the power to seven volts of twenty amperes capacity for charging local batteries; and the other to 130 volts, 5 amperes, for main batteries. In Ottawa a 250 volt power is reduced to seven volts for the locals and the mains are charged direct without reduction. In St. John the 114 volt lighting circuit is used. The locals are in two banks, of two cells each, of chloride accumulator, type E 9, one bank being charged while the other is discharging. There is no dead resistance inserted in the local circuits, as is the case where dynamos are used, extra cells providing the necessary power when quadruplexes or duplexes are extended at branch offices.

The switch for the main batteries consists of a series of spring-jacks and wedges, so designed that the jack is open, and a wedge cannot be inserted when reversed. The cells (which are C 3 type of accumulator) are arranged in banks of 40 or more as needed to meet the requirements of the office, and of a voltage sufficiently below the charging circuit. The negative pole is connected to the top of a wedge and positive to bottom. The wedges are all interchangeable. As many banks as required can be charged simultaneously.

In Canada, the C.P.R. has storage battery plants at Vancouver, Winnipeg, Ottawa and St. John, and dynamos at Toronto. The new Telegraph building in Montreal will also be equipped with dynamos. At present power in the latter place is obtained from the dynamo plant of the G.N.W.Tel. Co. I understand that the W. U. and G. N. W. Companies have storage plants at St. John, Quebec, London and Ottawa, and dynamos at Toronto and Montreal.

The adoption of either dynamos or storage battery for power on telegraph line has very materially improved the working of the lines, and at the same time effects a great economy. One or the other will gradually replace gravity batteries for all main lines, and the time may come when even the locals at wayside stations will be worked by storage battery cells which will be charged at some central point and sent out by train.

AN EXPLANATION OF A COMMON PHENOMENON NOTICED IN CABLE WORK.*

BY H. G. BARWELL.

It has probably been noticed by every electrician who has been engaged in cable work that during the whole time a splice is being made sharp kicks are noticed on the galvanometer employed for the usual dielectric resistance test.

On a recent repair, while picking up to a fault, a watch was kept for it coming in by means of a current direct to line through a milliammeter, to which was joined one side of a telephone receiver, the other side of the latter being connected through a 1 microfarad condenser to earth (as per Fig. 1). The current ob-

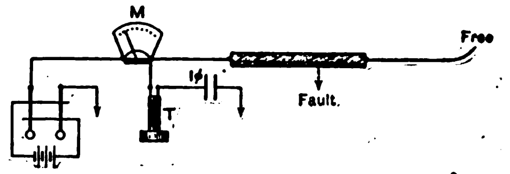

Fig. 1.

served on the milliammeter was 40 milliamperes. On commencing to pick up, the sound in the telephone was found to be intermittent—that is to say, there was alternate buzzing and silence, the cause of which I take to be as follows: The depth of water was 980 fathoms; 480 fathoms from the ship was a splice, type C to D, the latter type having each sheathing wire taped. The fault, which was two nauts beyond this splice, was caused by a wire of the type D having punctured the core at a bad twist, the iron wire remaining in the hole and apparently completely stopping any contact between the copper conductor and the water, as was shown by the fact that the resistance of the fault remained extremely steady at some 40 ohms and exhibited no signs of polarization with either current. It was evident, therefore, that the fault was in no way responsible for the intermittent buzzing in the telephone, and that it was probably caused by the ship rising and falling on the fairly heavy swell and bringing varying strains upon the splice, which at the commencement of picking up was about midway between the surface and the bottom. On the splice coming over the bow sheave, the buzzing became considerably louder, and continued, without any intermission, until it had passed the jockey, when, on stopping the drum to cut the cable, the noise ceased entirely. Instructions were then given to get the splice on the drum and worry it, and then to lay it on the deck again. This operation was repeated several times, and on each occasion the moment it was handled, buzzing recommenced, but stopped instantly on its being left alone. After cutting out the splice, its insulation was tested and found to be perfect, within the limits of observation. The telephone was then connected to the sea end containing the fault, and found to be absolutely silent, showing, as before stated, that the fault was in no way responsible for the buzzing. The milliammeter

* From the "Electrician," London.

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meanwhile had remained perfectly steady at 40 milliamperes, exhibiting no signs whatever of any variation of the resistance in circuit.

This phenomenon appears to be of the same nature as that mentioned in my first paragraph; and I offer the explanation that it is due to small changes in the capacity of the cable caused by variations in the resistance of the contact beween the respective sheathing

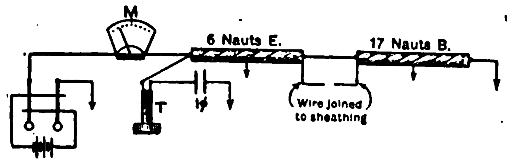

FIG. 2.

wires at a splice, these variations being due to the application of different strains or pressures, and that the effect is more noticeable when, as in the above case, one of the cables has each of its sheathing wires covered by a partially insulating tape.

As a proof of this the following experiment was tried: Six nauts of type E in one tank, and 17 nauts of type B in another, had their conductors joined together, and their sheathings brought into better electrical contact by means of connecting wires, as shown in Fig. 2.

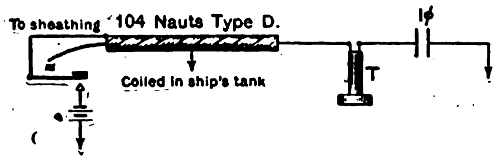

FIG. 3.

On tapping the ends of these connecting wires together a very distinct tap was heard in the telephone, which was equally audible when no current was being sent through the cables. One of the wires was then connected to a file and the other wire scraped over it, when it was observed that the sound in the telephone was very similar to that produced by handling a splice, being more of a buzzing than a distinct tapping. By this means Morse signals could be clearly read, although, as before mentioned, no current was being sent through the cables. The distant end of the type B was then freed, and a galvanometer put in place of the milliammeter, and on tapping the ends of the wires

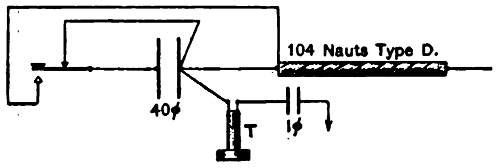

FIG. 4.

together kicks, similar to those observed while a splice is being made, were produced on the galvanometer. This, I think, proves fairly conclusively that the kicks are due to changes in capacity. It will be seen from the above experiment how very minute the variations in the resistance of the sheathing are which disturb the surface charges, and cause these effects; as, in the above case, the two sheathings were already in good contact with each other through the ship's hull, before the ends of the copper wires were tapped together, and more especially so as a considerable portion of each length of the cable sheathing was devoid of any outer serving. These disturbances are, I think, caused as follows: When two lengths of cable are spliced together, they take up charges which vary according to the respective localities along their length, and possibly also in proportion to the size of their cores, and rates of absorption, etc. Now, if any alteration is made tending to improve or the reverse the connection between their respective sheathings, the *status quo ante* is not maintained, and a redistribution of the free potentials takes place, producing the sound heard in the telephone. The two following experiments are also of interest.

A current was communicated to the sheathing of 104 nauts of type D, coiled in the ship's tank, to the conductor of which a telephone was connected, as shown (Fig. 3). On depressing the key signals were distinctly audible whether the home end of the conductor was freed or earthed, no difference being perceptible when the telephone was connected as shown, or to the home end.

Fig. 4 indicates the connections in the next experiment. It this two 20φ condensers joined in parallel had one of their plates connected to the core of the 104 nauts of type D, and also to one side of the telephone, the other plate being joined to the lever of the key, the lower contact of which was in connection with the cable's sheathing, and the upper to the opposite side of the condenser, so that the latter was short-circuited after each contact. With this arrangement sound signals were quite audible, but not so strongly as in the previous experiment; if, however, the telephone was connected to the far end of the conductor, nothing whatever could be heard. This effect was probably in greater part due to charges induced in the cable from the rolling of the ship, which were imparted to the condenser on depressing the key. These induced charges may also possibly play a part in the first experiment with the two lengths of cable, but I think there can be little doubt that the sounds are mainly due to the improvement in the contact between the two sheathings in this particular case, and the resulting redistribution of the free potentials.

From the foregoing it will be seen that by joining a telephone up as in Fig. 1 a splice can be heard when the ship is approaching it picking up, provided there is no other disturbing influence at work, such as a variable fault in the circuit; and knowing the depth of water, and noting the first indications of the splice being disturbed on the telephone, one may form a fairly approximate estimate of its distance from the ship.

ELECTRIC MINING MACHINERY AND LOCOMOTIVES.

BY FRANK C. PERKINS.

The various mining exhibits at the Paris Exposition show how important the subject is becoming, and the amount of energy used to bring this class of apparatus to the highest efficiency. The Paris exhibits shown in the illustrations, Figs. 1 and 2, of Sulzer Brothers., of Winterthur, Switzerland, and the American firm showing Jeffrey mining machinery and locomotives are particularly interesting. The firm of Sulzer Brothers not only shows electric boring machines in operation, but electric mining pumps, and electric ventilating apparatus. The American firm has not only its various mining machines on exhibition, but its

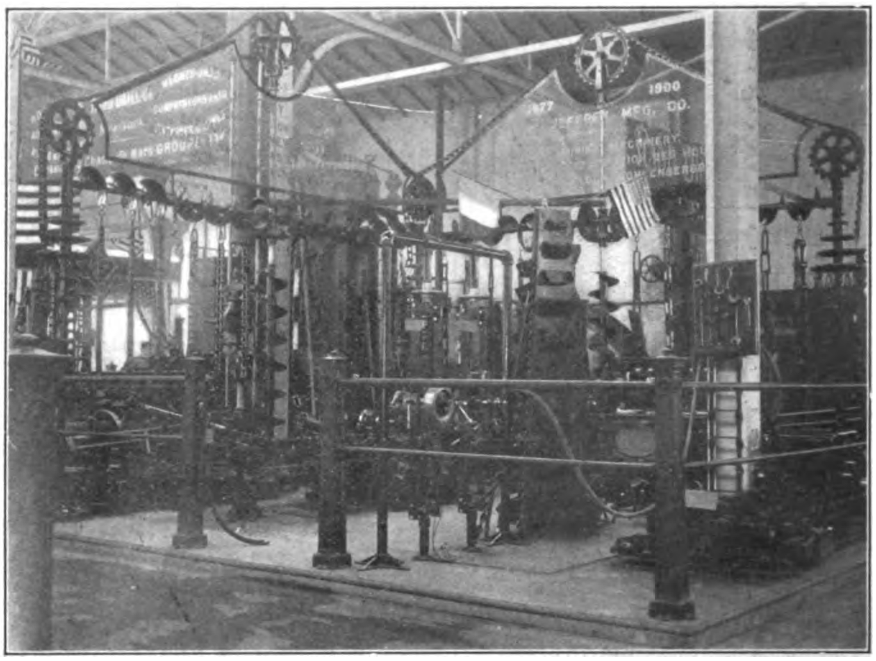

FIG. 1.—JEFFREY ELECTRICAL MINING MACHINERY EXHIBIT AT THE PARIS EXPOSITION.

mining locomotives operated by electricity were purchased and used by the Paris Exposition during construction for handling freight.

There are many uses to which electricity may be put in the operation of mines, but probably none are of more importance than that of the various haulage systems now employing electric locomotives.

The electric locomotive is especially suitable for mining work as it allows of extension and the many changes which are often necessary, while its great flexibility makes it particularly well adapted to this class of installation. It is built low and compact and can easily enter very small and narrow openings, while every part of the moving mechanism is enclosed and not exposed to injury. The mechanism is simple and the running parts are very accessible in case repairs are found necessary.

The mining locomotive shown in illustration, Fig. 3, has a draw bar pull of 3,500 pounds, and operates upon a 500 volt circuit. This machine is in operation in a mine in the Pittsburg district. The speed varies from six to ten miles per hour. There are two 40 horse power motors employed, and the total weight of the locomotive is about ten tons.

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This type is also operated from the center. The motors are of the iron-clad multipolar type, the armature and field coils being thoroughly waterproof and carefully protected by the motor casing.

Electric mining locomotives are not usually rated in horse power terms, but are rated on weight, while the same wheels when badly worn may show a friction amounting to 65 or 75 pounds per ton weight.

Electric locomotives used in mines are usually rated to give their full power at about six miles per hour. The starting is made with a modified form of the usual type of railway

FIG. 2.—SULZER MINING MACHINERY EXHIBIT AT THE PARIS EXPOSITION.

the weight on the driving wheels which determines their tractive power. A great amount of resistance is offered to locomotive and train of cars on curves, which frequently are of very short radius, and many times occur on quite heavy grades. The calculations of curve resistance are generally made on a basis of one pound per ton of train weight for each degree of curvature.

controller, and with light loads and low grades a much higher speed than the above is attained.

In a recent issue of ELECTRICITY (April 25), a detailed description of the mining machinery operated by electricity in the coal regions was given with particularly interesting photographs of the machinery as actually used and operated in the mines. These machines are of the same general design as those exhibited at the Paris Exposition and need no further explanation.

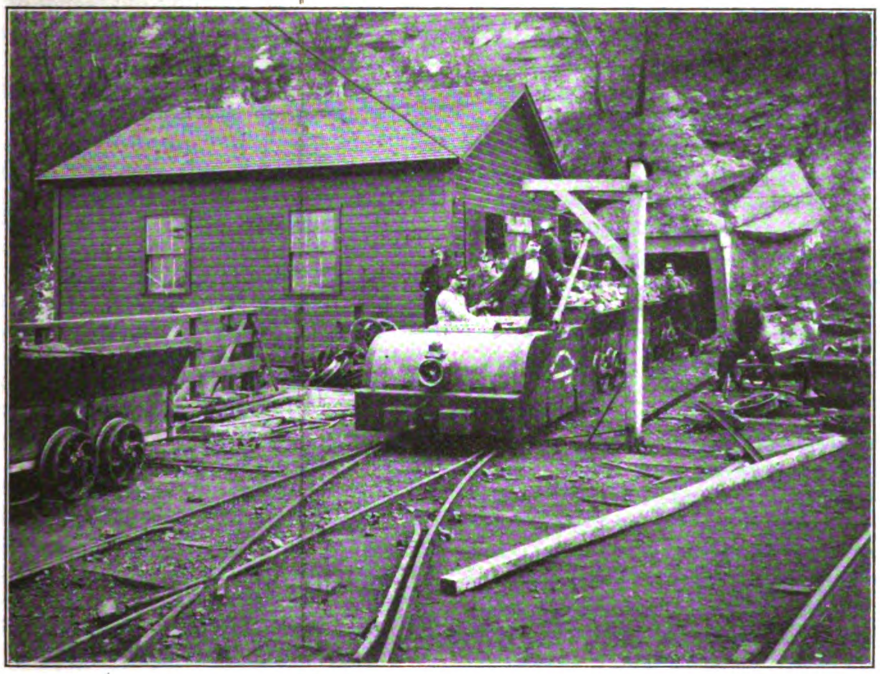

FIG. 3.—500-VOLT ELECTRIC MINING LOCOMOTIVE.

Mining wagons used for carrying coal have fixed axle and loose wheels and usually show from 25 to 35 pounds of friction per net ton

ELECTRICAL CONTACTS.*

BY F. C. MASON,
Superintendent Police Telegraph, Brooklyn, N. Y.

It is curious that the subject of Electrical Contacts has received so little attention in the literature and discussions of the general subject of electrical application. At the basis of nearly every variety of electrical apparatus, whether for signaling with small currents, or for the larger work of heating, lighting, generating and developing electric power and the application of electricity to chemical processes, the contact or point of discontinuity in the circuit is found as an essential part of the apparatus or of the method.

It is well, at this point, to say that this paper will be limited to those users of electricity employing relatively small currents, as in telephony, telegraphy and signaling, and will not touch on the larger field that its subject embraces in the utilization of heavy currents. However, the line of demarcation between the light current and the heavy current, is now by no means so sharply drawn as it was in the days when the primary battery, in one form or another, was the sole dependence of the telephone and telegraph engineer. When we see the motor-generators and the storage battery used as the central source of energy for a telegraph, fire alarm and telephone system, we naturally wonder for how long we can speak of the light current applications of electricity as a distinction from those employing large and powerful currents generated by dynamos.

Contacts may be roughly grouped into three classes: Those that are intended to be permanent (such as joints in wire and cables); those that are semi-permanent (such as contacts between wire and binding-posts), and operative contacts, or those that are intended to be opened and closed at will, as in keys, switches, etc.

To all these kinds of junctions, two enemies exist, constantly tending to destroy efficient electrical contact—chemical action and dirt. It is scarcely necessary to speak of mechanical strains, which are guarded against naturally by the exercise of common sense. Chemical action, as it applies to contacts, is generally due to remnants of some compound or chemical used in soldering, and to the action of air and moisture (either singly or in conjunction), producing oxidation of the surfaces in contact. This action is enormously enhanced by the formation of *sparks* at contacts of the operative kind, the resultant film of oxide being generally a non-conductor and interfering greatly with the operation of the contact. Dirt, as Emerson says, is merely "matter out of place." In electrical work, dirt means any non-conducting substance that interferes with good electrical contact. It is often dust, but in operative contacts is more frequently the products of oxidation of the points of contact themselves, where (as is too often the case) these are of the baser and more oxidizable metals.

Permanent joints, or contacts, are used both in line conductors and in instruments. Nowadays, the general introduction of hard-drawn copper wire for overhead line work, has reduced practice in this kind of jointure to a question of the best way to handle that material. Experience has shown that soldering such joints draws the temper of the wire, making a joint

* Paper read at the Fifth Annual Meeting of the International Association of Municipal Electricians, held at Pittsburg, Pa., Sept. 25-27, 1900.

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of mechanical weakness, while the ancient habit of linemen, of twisting the wire at the joint into tight spirals, leads to the same result. For these reasons, the twisted and soldered joint must necessarily give way to one of the various and excellent types of tubular joint now manufactured for the purpose. In cable work, especially, where paper insulation is used, the best practice now, strangely enough, is to use merely the twisted joint without solder. The wire being soft and subject to no strains, the joint is abundantly strong; while its sheathing, after jointing, fully protects it from the harmful action of the atmosphere and moisture. To solder such a joint would merely add the danger of corrosion from the dissolving action and slow electrolysis of the fluxes used.

Permanent joints, in switchboards and instruments, being protected from the weather, are generally soldered. The wires used should be tinned, so as to leave no excuse for the use of the mischief-making chemicals sold as "soldering solutions." Tubular solder, having resin or stearine flux in its hollow part should be used and the utmost watchfulness employed to keep the acid and "salts" away from the work. One easy joint made by these means may plant the seeds of trouble to be reaped later, and by the peculiar provision of fate, almost invariably just when trouble or break-down is most to be feared.

Semi-permanent contacts are, practically, of only two kinds—binding-posts and fuses. The average American binding-post is a piece of metal with a hole drilled through it to receive the wire and another drilled and tapped to receive a set screw, which may or may not have a pointed end. The design of this type of binding-post is utterly vicious. The screw may shear the wire nearly in two, leaving it so that the slightest strain will break it off, or it may not come down to a tight-bearing on the wire, leaving a loose joint ready to collect dirt and become inoperative. Much the better type is that variety of binding-post in which the wire is firmly held between two flat surfaces, thus ensuring a large area of contact, and which is provided with a lock-nut, so as to avoid any danger of the binding washer working loose. In instruments having binding-posts of the other type, considerable improvement can be introduced by putting small hexagonal nuts, a little larger than the driving heads of the binding screws, on the latter and setting them down firmly on the top of the post to act as lock-nuts.

In fuses, which are an absolutely necessary part on any installation in a modern city traversed by electric light and railway conductors an excellent opportunity for bad contacts presents itself. The practice of securing the fuse-wire under a washer or the head of a screw is very bad, as the wire is strained, is apt to be reduced in section at some point, and cold flow of the fuse may take place. To obviate these troubles, it is usual to attach pieces of copper to the ends of the fuse-wire, screwing these down tightly under the binding washers. If the fuse, as is too often the case, is merely squeezed into the copper end, the trouble is only transferred to another point. Hence, the best solution of the fuse difficulty is to use copper lugs, to which the fusible wire is securely soldered, held down by screws provided by lock-nuts. Care should be taken in installing fuses not to set them in place under strain, as their expansion and contraction under temperature changes, produces crystallization of the metal or reduction of its cross section at some points.

While the two classes of contacts already referred to are, in a large measure, in the hands of the operating force of a fire-alarm, telegraph or telephone installation, the third class, and the most imporant to all of us—the working contacts of instruments—are confined to these structures and their nature is determined by the manufacturer. In keys, relays, vibrating gongs, the switching apparatus of the telephone station, and in all other places where signaling circuits must be made and broken, sparks will be formed, and no practical device known to the art can prevent their formation. While dust, always inimical to good contacts, can be excluded from such places by proper construction of the instrument, nothing will prevent the formation of oxides at the point of sparking, which is also the point of contact, except making these points of some material that will not oxidize.

For this purpose, the only substances known that are at the same time good conductors of electricity and possess the necessary qualities of mechanical strength, are platinum and a few other of the rarer metals, such as iridium and gold. The consensus of opinion and experience has shown platinum or certain of its alloys to be the only substance commercially available for the construction of contact points of this character. Unfortunately, platinum is a material of such great value that the expense of such contacts is greater than that of any other kind, and, therefore, the temptation of the manufacturer to replace such contacts with those of cheaper material, or to stint the size, has been very great, and too often he has fallen before it. He has introduced contact points of the baser metals in his instruments and this has far too often invited, if not assured, disaster.

Blame for substitution of such cheap contacts cannot rest entirely upon the manufacturer, so long as the users of electric signaling apparatus fail to recognize the value of the higher-priced article, or recognizing it, fail to specify its use when awarding contracts, and to see that this vitally important detail has been honestly and intelligently executed in the completed instruments.

Pure platinum is a very soft metal, and therefore is not as serviceable for contacts subject to mechanical blows as certain alloys of the metal with other members of the platinum group of metals. The production of platinum alloys specially adapted for contact under all conditions of current density and temperature has been very carefully investigated by Baker & Co., the platinum refiners of Newark, N. J., who now regularly manufacture a number of alloys possessing all the requisite properties for durable and perfect contacts. Their "XXV" brand is especially designed for use in electric signaling apparatus, and is now generally specified in awarding contracts for high-grade instruments.

For commercial reasons, the composition of this and other alloys is kept secret: but as to the operative value of contacts made from these alloys, I can say from personal observation that too much credit cannot be awarded this firm for their conscientious efforts to produce an article so vitally important to the certain operation of signaling apparatus and which fully meets our exacting requirements.

In municipal work, more than in any other, the electrical equipment must be absolutely reliable. A bad contact, sticking together or full of oxides may mean loss and danger of the gravest sort to the community. Through failure of the fire apparatus to respond to an alarm, or of the ambulance to answer its call, or of the police to appear promptly when summoned, a bad contact may exact a fearful toll in conflagration, or death or riot. And, in the saving of a few cents' worth of platinum the vast expenditures of municipalities for fire and police protection and of the generous public for hospitals, may be nullified. There is no room for economy of this wasteful kind in instruments upon which so much depends and to which, owing to the careful and conscientious superintendence of the members of this Association, the public looks with perfect confidence for perfect results.

THE ETHICS OF INSULATING MATERIALS.*

BY J. WRIGHT.

It is not my intention here to discourse upon insulating materials in general, but rather to confine my remarks to a consideration of those substances, chief amongst which are india-rubber and gutta-percha, so largely employed for the insulation of electric cables and wires.

The growing scarcity of the above-mentioned commodities recently led to a short general article in a contemporary from the pen of Mr. Terry, an authority of note on the subject, in which the writer comments upon the various substitutes for rubber and gutta-percha which have been introduced to a greater or less extent during the past few years.

It is not by any means so easy a task as would appear at first sight to obtain a satisfactory substitute for rubber and gutta-percha in the insulation of cables. It must be remembered that flexibility, combined with mechanical strength, and resistance to the passage of electric currents of varying tension, disruptive or otherwise, to say nothing of absence of porosity and durability under extremely variable climatic conditions, are but few of the many essential properties which must be possessed in the requisite degree by the substitute. India-rubber, or caoutchouc, as we all know, is a gum obtained from the sap found in the middle layers of the bark of certain trees indigenous to South America, Africa and the East Indies. It exudes on an incision being made in the bark for the purpose, and is collected by the natives of the locality in various ways. The main object aimed at, however, whatever be the manner in which it is undertaken, is to procure the coagulation of the rubber by exposing it in thin layers to the smoke of a wood fire fed with a species of nut also indigenous to the locality, and collected for the purpose.

If this drying be not properly effected, the rubber retains a certain compound which acts as a form of solvent and destroys it. This destructive agent is always present in a greater or lesser degree, and shows its presence in rubber which has been exposed to the atmosphere for a lengthened period, by converting it into a treacely mass contained by an outer oxidized crust which is extremely brittle.

The best, or Para rubber, when freshly procured, is extremely elastic, and has a generous modicum of "life," but, unfortunately, it is impossible to employ it in this condition for insulating purposes, as the impurities which all samples contain necessitate a somewhat severe

*From the "Electrical Review," London

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course of washing and mastication in powerful machines specially designed for the purpose, which treatment decreases its vitality in a marked degree, but, at the same time, renders it, in the form of sheet or strip, of such consistency as to be suitable for applying to the cable.

Pure Para is too expensive to employ alone as an efficient insulating coat, and it is, therefore, applied as a single thin layer, supplemented by a layer or layers of compound rubber which consist of an admixture of pure rubber with certain other ingredients, such as french chalk, sulphur, naphtha (as a solvent), etc, with which, by a due series of apportioning the quality and nature of the resultant rubber compound is toned, so to speak, to the pitch required in practice. The resultant rubber, as may be expected, is in the form of a workable mass, not unlike thick putty in the majority of cases, and in this state is applied to the cable or wire in the form of strips.

Now, there are two methods of applying rubber strip to a cable. One, the slower and more expensive method, is by lapping it spirally, two adjacent layers being lapped in opposite directions in order to absorb the joint and render the coating homogeneous. The other method, and the one more generally adopted, is by longitudinal compression. Two strips of rubber are applied to the cable, one above and the other below, and are compressed together at the sides in the form of a seam, by their passage with the cable between a pair of hard steel rolls revolving in contact, and semicircularly grooved to the finished diameter of the covered cable. The seam thus made is an efficient one, and depends on a peculiar property possessed by rubber to a marked degree, viz., cohesion. If two freshly-cut rubber surfaces be brought into immediate contact, they will cohere and form as homogeneous a mass as the uncut remainder.

Mr. Terry in his article especially refers to the seam in rubber-covered cables, and, I think, rather inclines to regard it as a weak point, but if proper precautions be taken for the exclusion of dirt and moisture, and the covering rolls be accurately turned so as to form a complete circle, there is no danger of weakness.

The subsequent process consists in spirally lapping the cable with a strong canvas tape to resist expansion and its subsequent vulcanization by exposure to steam pressure at a stated temperature for a certain period. This latter process imparts elasticity and durability to the compound by a combination of sulphur, which is one of the ingredients.

By the judicious apportioning of the ingredients in the rubber compound, and by varying the thickness of the primary coating of pure rubber, the insulation resistance per mile of the finished cable is controlled, and in this manner any result from a few megohms to several thousand may be obtained. The subsequent results are, of course, slightly variable i.e., they do not resolve themselves into round figures, but an approximation to the required result is easily obtained by experiment. It is also possible to vary the subsequent insulation resistance by the degree of vulcanization, for the longer a rubber compound is vulcanized up to a certain point, the higher will be its immediate insulation resistance. Such treatment, however, beyond the recognized time limit is extremely injurious, as it shortens the "life" of the cable by artificially aging it; it is a trick resorted to nevertheless by unscrupulous manufacturers to bring their cables up to the specified insulation.

In the earlier days of rubber-insulated cables it was a recognized thing for engineers and others to specify high insulation resistances, and insist on having them, a custom which has, however, led to an investment in wisdom at the expense of the purchaser. With rubber, as with gutta-percha, it is not "initial meghoms per mile" which are required as much as durability, low electrostatic capacity, and resistance to disruptive discharge.

I have as yet touched but lightly upon the vulcanization process, which is based upon one of the most important properties of rubber, viz., that of combining chemically with sulphur when under steam pressure at temperatures varying from 250° to 350° F. The action is purely a chemical one, and the rubber, after the process, assumes an elasticity and durability which it did not possess in its raw mixed condition; moreover, the longitudinal seam due to manufacture, is rendered homogeneous by it, and is, in fact, difficult to localize after vulcanization. It is important to blend with the other ingredients just sufficient sulphur, and no more, than the rubber will take up, as, otherwise, a certain quantity of sulphur will be left free, and will, by its presence, tend to corrode the copper conductor. For this reason the latter is tinned, and in many cases what is known as a "separator" or layer of rubber with little or no sulphur in its constitution is introduced between the primary layer of pure, and the outer one of compound rubber, with the object of absorbing any excess of sulphur not taken up by the latter.

With a good quality, properly vulcanized, rubber-covered cable or wire one can do almost anything, short of willfully damaging the rubber coat. It will stand bending round its own diameter, and, indeed, very severe handling, before deleterious effects will be observed.

Gutta-percha, also an expensive material for insulating purposes, is not suitable for electric light and power work, where an appreciable rise of temperature in the metallic conductors themselves is at times unavoidable, owing to its susceptibility to variations of temperature. It is, however, admirably adapted for sub-marine telegraph cables, and also for telegraph and telephone wires laid underground. When new, it has a very light tint, but ages rapidly with exposure to air, darkening in color, owing to the formation of a crust of oxide on its outer surface, which becomes very brittle. The best conditions for its maintenance are to place it under water having a fairly even temperature of from 40° to 80° F. This prevents oxidation, and it will last under these conditions for years.

For underground work it is usually covered with a strong spiral canvas tape saturated with Stockholm tar, from which, however, the natural acids have previously been extracted. This latter is an important point. Such a covering has a similar preservative effect to the foregoing immersion in water, and it prevents ingress of air, and, in a moist atmosphere, at a fairly even temperature, answers very well.

The well-known Callender cables are insulated with a substance known as "bitite," which consists essentially of purified vulcanized bitumen. They are very suitable for low pressure town mains and feeders where they are not likely to be disturbed, and, for such purpose, are usually laid in troughs filled up solid with a bituminous compound. For general work, however, they will not stand the manipulation that rubber insulated cables are capable of withstanding.

Fibre cables, another substitute for rubber, are certainly cheaper, but they have many disadvantages, which, to a certain extent, annul any advantages due to a low prime cost. They consist mainly of a fibrous material, such as hemp, loosely wrapped round the conductor, and impregnated with suitable insulating compounds, such as bitumen, etc., and subsequently sheathed with lead to exclude moisture. Their disadvantages are numerous: in the first instance, fibrous materials are hygroscopic, and require to be well heated to expel any moisture which they may contain before being lead-sheathed. This heating tends to destroy the fibre. Then, again, air, although a splendid insulator when in a dry state, is unable to withstand disruptive discharges of electricity and it is practically impossible to manufacture a fibre cable and guarantee the insulating material absolutely free from air, as the latter is readily retained in the form of minute bubbles, which, when the cable is subjected to a high emf., speedily assert their existence by the breaking down of the insulation at that point. Finally, these cables absolutely depend for their insulating qualities on the total exclusion of moisture, and a pinhole in the lead sheathing, although not discernible under the initial tests, means the subsequent development of a fault. Pure lead also, if placed directly in the ground, is very subject to corrosion, although a slight alloy of tin decreases the risk in this respect.

To pass on to paper insulation. As far as telephone work is concerned, paper has evidently come to stay. As an insulating material it is light, cheap in prime cost, and—most important point of all—its specific inductive capacity is extremely low compared with other materials, all of which render it an admirable insulator for underground multiple wire telephone cables. Such cables have been largely adopted by the National Telephone Company, the paper being packed quite loosely around the wires in the lead sheathing, and, in conjunction with their system of passing a continuous current of dry air through the containing sheath, have proved highly satisfactory.

For electric light and power, paper insulated cables, as manufactured by the British Insulated Wire Company, of Prescot, for instance, are subject to the same disadvantages as fibre cables, but withal, are of comparatively low prime cost and are eminently suitable for low pressure mains and feeders, as well as with a greater thickness of dielectric for high pressures.

Summing up the various materials in vogue for cable insulation to-day, what is urgently required is a substance which, while possessing the durability, elasticity and imperviousness of rubber, shall be cheap, and yield good results electrically, i.e,, it must possess a low specific inductive capacity, and a high specific resistance, under all ordinary conditions, and above all, be capable of easy application to the wire or cable which it is intended to insulate.

Such a substance is not at present on the market, but a fortune awaits the lucky individual who discovers and patents such a compound.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended September 26:

Antwerp, 14 cases, $2,016; Australia, 47 pack-

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ages, $4,517; 5 cases, $328; Berlin, 3 cases motors, $540; Brazil, 18 packages, $2,234; 539 packages electric railway supplies, $80,772; 43 cases, $5,557; Bremen, 16 cases,$2,043; 13 cases motors, $2,360; Bristol, 72 cases, $5,009; British Possessions in Africa, 156 packages, $11,001; British West Indies, 5 packages, $230; Bolton, 2 cases motor parts, $290; Central America, 1 case, $27; Chili, 13 cases, $348; 6 packages $200; Cuba, 14 cases, $181; Ecuador, 2 cases, $120; Glasgow, 27 cases, $4,661; 1 motor, $145; Hamburg, 129 cases, $13,634; Havre, 55 cases, $4,063; Lisbon, 69 cases $2,422; Liverpool, 135 packages, $12,694; 1 box, $20; London, 71 packages, $2,958; 72 cases, $2,800; Manchester, 5 cases, $406; Mexico, 1 case motor parts, $64; 547 packages, $12,026; Newcastle, 4 cases, $2,960; New Foundland, 4 packages, $85; Nova Scotia, 8 cases, $41; Oporto, 7 cases, $368; Peru, 22 cases, $1,193; Southampton, 48 cases, $5,649; St. Petersburg, 15 cases, 841; Trieste, 2] cases. $847; Venezuela, 241 packages. $1,545.

The following are the exports of electrical material and machinery from the port of New York for the week ended October 3:

Antwerp, 8 cases, $761; Argentine Republic, 218 packages, $8,747; 50 cases, $3,195; Barcelona, 14 cases, $840; Brazil, 67 packages, $2,818; 5 cases, $438; Bremen, 5 packages, $218; Bristol, 33 packages, $2,608; British West Indies, 30 cases, $943; British Possessions in Africa, 43 cases, $3,424; British East Indies, 1 case motors, $33; 26 cases $430; British Guiana, 2 cases, $73; Brussels, 15 cases, $327; Catania, 34 packages, $6,388; Cuba, 38 packages, $1,588; Danish West Indies, 1 package, $10; Dublin, 1 package, $185; French West Indies, 1 package cables, $14; Genoa, 2 cases automobiles, $1,000; 174 packages, $7,332; Glasgow, 381 packages motors, $4,582; 15 cases, $1,094; Hamburg, 10 packages, $2,154; 115 cases, $7,275; 2 packages trolley material, $250; Havre, 72 packages, $3,931; Hayti, 1 package, $50; Huddersfield, 13 packages, $304; Japan, 195 packages, $19,723; 73 cases, $9,384; Liverpool, 109 packages, $11,744; 1 case automobiles, $1,300; 6 cases, $190; London, 135 cases, $5,524; 72 trolley poles, $2,375; 25 packages motors, $481; 160 packages, $10,306; Manchester, 2 cases motors, $770; Marseilles, 2 cases, $180; Mexico, 18 cases, $3,806; Milan, 47 packages, $15,065; Naples, 99 cases, $6,865; Newcastle, 26 packages, $4,000, Peru, 18 packages, $537; Plymouth, 1 case, $6; Porto Rico, 1 case motors, $25; 27 packages, $446; Rotterdam, 28 packages, 228; Santo Domingo, 2 cases, $10; Southampton, 14 cases, $405; Stockholm, 1 package, $80; U. S. Colombia, 22 cases, $562; Venezuela, 2 packages, $38; Westeras, 1 package, $53; Zurich, 1 case, $49.

Dixon's Graphitoleo

The automobile is a self-propelled pleasure or business carriage. The three distinct types are the steam-carriage, the electric vehicle and the internal combustion engine. Each has its advantages and its disadvantages, but all three types are equally dependent on the proper working of the running parts.

Furthermore, in all three types it is especially desirable to waste as little power as possible, and to do this, the running parts must not only run properly, they must run smoothly and with the least amount of friction. For the best results, and for the greatest amount of pleasure to the occupants, the automobile must be treated as a machine—the same as the locomotive and the stationary engine.

The power transmission between engine and axle is usually by chain and sprocket, with a differential gear on the axle. To prevent rust and wear and to save power, all chains and gears should be lubricated with some form of graphite lubricant. It is graphite—Dixon's Pure Flake Graphite—that has proven most satisfactory for the chains of bicycles, and for all types of machines up to the mightiest steam locomotive that rushes along at more than a mile a minute.

Dixon's Pure Flake Graphite is prepared in various ways so as to make it suitable for the running and wearing parts of all the different types of automobiles. There is no substance that can equal it as a lubricant and it is generally used on all power machinery, large or small.

INCORPORATIONS.

The Mead Electric Company, Marion, Ind. Capital stock, $100,000. Directors: M. C. Mead, O H. Keller and Mary C. Mead.

The Pacific Electrical Works, Los Angeles, Cal. Capital stock, $250,000. Directors: Monroe Markham, G. L. Hardison, H. E. Carse, Los Angeles; L. W. Andrews, Ventura; Frank Taylor, Brookline, Mass.

The Washington Electric Supply & Mantel Company, Seattle, Wash. Capital stock, $10,000.

The Citizens' Electric Light & Power Company, Sandusky, O. Capital stock, $100,000. Incorporators: N. W. Dalton and J. F. Parkhurst.

The Olney Electric Light & Power Company, Olney, Ill. Capital stock, $28,000. Incorporators: Henry E. Hughes, Edward S. Hughes and William Bower.

The Aiglon Electric Company, New York City. Capital stock, $5,000. Directors: Jules E. Serre and Gustav Nordin, New York City, and H. R. Anderson, Rahway, N. J.

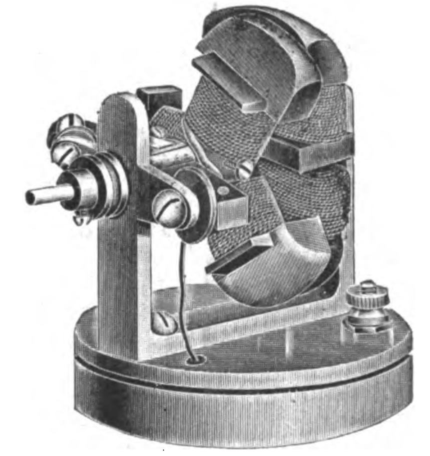
The Venice Electric Light & Power Company, Venice, Ill. Capital stock, $40,000. Incorporators: G. A. Nieman and F. Kohl.

The Versailles Electric Company, Versailles, Ky, Capital stock, $18,000. Incorporators: Edward Gunster, C. E. Stegmaier and John D. Farnham.

The Uniontown & Monongahela Valley Electric Railway Company, Uniontown, Pa.—to build and operate electric railways. Capital stock, $450,000. Incorporators: H. L. Robinson, W. C. McKean, I. E. Partridge, L. B. Hamilton, all of Uniontown; A. O. Lorentz of Meyersdale and J. S. Bryner of Scottdale.

COMMERCIAL PARAGRAPH.

The American Oddity Company, 170 and 172 West Broadway, New York, has recently placed on the market a novel motor—shown in the accompanying illustration—which has the advantage of requiring little power to operate it. The weight of this motor, which is known as "Oddo"



Junior, is but 11 ounces, and owing to the length of the arms of the armature (the magnetism going to the extreme ends) an unusal amount of power is derived through leverage, The "Oddo" Junior will run well on one dry cell and as the price postpaid is but $1, there should be a lively demand for this little piece of electrical mechanism.

COMING ELECTRICAL EVENTS.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N. W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED OCTOBER 2, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

658,854. Car-Fender. Henry Lutzenkirchen, Hartford, Conn., assignor of one half to Camillo L. Fischer, same place. Filed Feb. 14, 1900.

659,169. Mechanism for Supplying Electric Power to Railway-Cars. George F. Gale, Boston, Mass. Filed March 21, 1899.

659,178. Electric Railway System. Edmund C. Morgan, Chicago, Ill., assignor to the Morgan Electric Machine Company, same place. Filed Jan. 2, 1900. Renewed Sept. 10, 1900.

659,179. Combined Third and Traction Rail for Electric Railways. Edmund C. Morgan, Chicago, Ill., assignor to the Morgan Electric Machine Company, same place. Filed Jan. 2, 1900. Renewed Sept. 10, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

659,061. Electric Lamp. Frank L. Fowler, Philadelphia, Pa. Filed Oct. 26, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

658,821. Electric Generator. Leonidas G. Woolley, Kenton, O. Filed Dec. 28, 1899.

658,925. Electric Switch. Nathaniel D. Rand, Watertown, Mass. Filed Feb. 10, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

659,096. Combined Relay and Repeater for Telephone Lines. Edward C. Paramore, Philadelphia, Pa., assignor of one-half to Howard T. Goodwin, Ridley Park, Pa. Filed Nov. 18, 1899.

MISCELLANEOUS.

658,792. Circuit Making and Breaking Device. Paul M. Lincoln, Niagara Falls, N. Y. Filed Oct. 19, 1898.

658,808. Motor-Wheel for Automobiles. Herbert Simmons, Wellston, O. Filed April 3, 1900.

658,860. Cover for Battery-Jars. Philip P. Nungesser, Cleveland, O., assignor to the Nungesser Electric Battery Company, same place. Filed Feb. 18, 1900.

658,862. Telegraphone. Edward C. Paramore, Philadelphia, Pa., assignor of one-half to Howard T. Goodwin, Ridley Park, Pa. Filed Nov. 18, 1899.

658,865. Secondary Battery. Henry C. Porter, Chicago Ill., assignor to Owen H. Fay, same place. Filed Dec. 27, 1898.

658,891. Electrode and Electrode Connection. Henry Carmichael, Malden, Mass., assignor to S. D. Warren & Co., Boston, Mass. Filed May 11, 1899.

658,892. Canal-Boat Propulsion. Justus B. Entz, Philadelphia, Pa. Filed Feb. 10, 1900.

658,900. Battery Fluid. Gennaro Romanelli, New York City Filed Jan. 13, 1900.

658,905. Electric-Current Regulator. Daniel Watkins, Davenport, Ia., assignor of two-thirds to C. J. Ruymann, same place. Filed March 28, 1900.

658,924 Electrical Fitting. William T. Pringle, Lansdowne, Pa. Filed Feb. 12, 1900.

658,929. Electrical Semaphore System. Judson Shoecraft, Topeka, and Charles C. Gardiner, Bradford, Kan.; said Shoecraft assignor to said Gardiner. Filed June 20, 1899.

658,997. Electrical Propelling Apparatus. David Perret, Neufchatel, Switzerland. Filed June 20, 1890.

659,012. Automobile. Otto V. Bachelle, Chicago, Ill. Filed Oct. 2, 1899.

659,028. Phonograph. Barton B. Hill, Paris, France. Filed March 10, 1899.

659,080. Supporting Frame for Motors of Electric Carriages. Charles A. Lindstrom, Chicago, Ill., assignor, by direct and mesne assignments, to the Hewitt-Lindstrom Motor Company, same place. Filed May 5, 1899.

659,121. Appliance for Automobiles. Edward W. Ayres Washington, D. C. Filed June 16, 1900.

659,128. Steering Mechanism for Ships. Andrew B. Brown, Edinburgh, Scotland. Filed March 13, 1900.

659,142. Crossing for Suspended Electric Conductors. John Floyd, Washington, D. C. Filed Feb. 2, 1900.

DESIGNS.

33,303. Electric Switchboard. John Marion Creamer, Knoxville, Tenn. Filed July 23, 1900.

33,304-33,305. Lining for Switch-Caps. George B. Thomas, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, same place. Filed Aug. 27, 1900. Term of patent 14 years.

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THE TELEPHONE WORLD.

President Pro Tem. of American Bell Telephone Company.

Directors of the American Telephone & Telegraph and American Bell Telephone Companies have elected Alexander Cochrane president pro tem. succeeding John E. Hudson, deceased. Mr Cochrane is a director and member of the executive committee of both companies. The vacancy in the directorates, caused by the death of Mr. Hudson was not filled.

Articles of incorporation have been filed in Trenton, N. J., for a new telegraph, telephone, ticker and messenger service company to be known as the Exchange Telephone Company, with a capital stock of $5,000,000. The incorporators are Louis B. Dailey, Clifford Perkins, Evan J. Dudley, Charles A. Barkley, Kenneth McLaren, Horace S. Gould, Willard W. Baldwin, Thornton Parker, J. I. Billings and Adolphus Suedburg, Jr., James B. Vredenburgh, a Jersey City lawyer, who filed the papers, said that New York and Chicago capitalists are interested in the new concern but refused to make known their names or the plans of the company. The New Jersey Corporation Trust Company, with offices at 60 Grand street, will be the Exchange Telephone Company's New Jersey agent.

A syndicate headed by George R. Webb of Baltimore, Md., has bought out the Allegheny County Telephone Company of Pennsylvania. The company operates 850 'phones where the Carnegie works are located and at Braddock, a few miles outside of Pittsburg. These plants will be operated by interests friendly to the Pittsburg & Allegheny Telephone Company, which was financed by Baltimore capitalists. The Pittsburg & Allegheny Telephone Company has secured ordinances in Charleroi, California, East McKeesport, Swissvale and other points.

The Standard Telephone Company of Dubuque, Ia., began installing telephones recently. The company has four cables, each of 30 wires, and has laid cables in the alleys between several streets of that city. It has contracts with over 500 patrons for telephones and will put these in first. It expects to put in 1,200 to 1,500 'phones before a year. The rates will be $24 for a business house and $15 for a residence within a radius of one mile of the central station. Beyond that the charge will be increased in proportion to the distance.

The Bell Telephone Company is putting a free telephone in the office of City Clerk Hawken, of Kirkwood, Mo., and thereby hangs a tale of public enterprise pushed out in a new direction with success little hoped for by the pushers. The telephone is being put in at the request of the Kirkwook city council, on the theory that when a company puts a border of unsightly poles along the streets of a town, it ought to show the town some favors.

A short time ago the York, Pa., Telephone Company opened its lines into a new section of the county—to Lewisberry, Yocumtown, Newberrytown, Strinestown and Goldsboro. All of these connections are what is known as free 'phones to subscribers, or rather no additional toll is charged to reach those places. These new 'phones open a largely settled community to quick intercourse, which will not only be of infinite benefit to York but to those towns also.

Stockholders of the Isle of Wight, Va., Telegraph & Telephone Company, a local enterprise, met recently and elected Joseph W. Holloway, president, and J. W. Thomas, who was named as secretary and treasurer. The intention of extending the telephone lines to Waverly and ultimately to Petersburg was announced.

The Central District & Printing Telephone Company of Allegheny, Pa., will have to stand trial in criminal court on the charge of maintaining a nuisance in erecting telephone poles on the pavement of property owned by a citizen of that place.

A local company is being formed for the purpose of putting in an independent telephone line in Athol, Orange, Erving, Farley and Miller's Falls, Mass. It is the intention of the company to furnish telephones to subscribers for $1 per month.

Charles Morris, former proprietor of the Harrison Telephone Exchange, of Little Rock, Ark., has secured the franchise for an exchange to be established at Sapulpa, I. T., and will start construction work on his lines this month.

The Falls County Telephone Company is preparing to build another line from Marlin, Tex., to the bridge over the Brazos on the turnpike road.

The Pacific States Telephone Company made a net gain of 1,834 subscribers in September, the total number connected is 80,686, which includes 20,162 in San Francisco.

Pocket Telephone.

Evan Shelby, manager of the Lafayette, Ind., Telephone Company, has invented a pocket telephone for the use of police patrolmen in cities.

Mr. Shelby's plan is to place a number of small boxes on telephone poles in various parts of the city, equip each box with a battery and connect them with the central office. The boxes will be about 3 feet high, a foot in width and 8 or 10 inches deep, to admit a complete battery. In the bottom of the box, which is to be placed at convenient height on the pole, there will be a jack, into which a plug is inserted to make connection with the central office. Every policeman on the force will be supplied with his own pocket 'phone, which will enable him to hold communication with anybody in the city who has a telephone. The Shelby pocket telephone is small—not as large, and much lighter than a revolver—and can be conveniently carried in the officer's pocket. It is about 8 inches in length, and weighs less than seventeen ounces. On one end is a special transmitter, and on the other is a receiver. It is so made that when the receiver is properly placed to the ear, the transmitter is directly in front of the mouth. The receiver and transmitter are so constructed that they may be folded together when not in use, and can be adjusted to fit any head. An ordinary exchange plug is connected with the instrument and when inserted in the jack in the box, the connection with central is automatic, and the patrolman may call for any number he wants.

The Bell Telephone Company of Philadelphia has granted its stockholders the privilege of paying in three installments, on November 19, January 18 and March 18, for the new $1,000,000 issue of stock. The money subscribed, as well as the first $1,000,000, which makes the $2,000,000 authorized by the shareholders in March, will be used for betterments. The scheme is to provide a plant which will serve not only the 14,000 present subscribers, but 26,000 more, which the company expects to gain in the next few years. The company's gross receipts have materially increased over those of a year ago, but the net earnings, owing to expenditures, have been less than last. It is claimed that the company has been earning enough to pay the 8 per cent. dividend regularly.

W. H. McCulloch, of Vicksburg, Miss., of the Cumberland Telephone Company, recently returned from a business trip to Lake providence, La., where his company is arranging for a telephone exchange for that town also for a long distance service crossing the Mississippi at that point by cable, connecting with the long distance line to all points in the United States. A most desirable office has been secured at Lake Providence, and already the exchange has sixty five subscribers. Mr. McCulloch states that the service will be carried in an area of fifteen miles out of Lake Providence. He located the cable which will be about two miles in length, and hopes to have the entire service in operation in the next ninety days.

The Cumberland Valley Telephone Company has decided to build its line from Greencastle to State Line, Pa., where it will connect with the Hagerstown Company for through business. The Fulton and Franklin County line, which runs to Foltz, McConnellsburg, Welsh Run and Clear Springs, Md., has been purchased, which will put a stop to the negotiations pending between the Bell and the Franklin and Fulton Companies, and will give Mercersburg, Foltz and McConnellsburg exclusively to the Cumberland Valley line. The purchase of this new line will connect Welsh Run, Kaiserville, Clear Spring, in Maryland, and Waynecastle, State Line and Middleburg, in Pennsylvania.

The Inland Telephone Company will extend its service to the United States Marble Company's property, nine miles west of Valley, Wash. A switch system will be put in so that either the mill, boarding-house or quarry, which are about a quarter of a mile apart, can be reached from Spokane, Wash. The system is also so arranged that there will be communication between all parts of the property.

A new telephone system of modern pattern is being put in at the penitentiary at Columbus, O., by the board of managers. The wire will be copper with rubber insulation. A new keyboard of the latest design will be placed in the office of the deputy warden, which will be the "central office" of the penitentiary telephone system.

Franchises were lately granted the Chesapeake Telephone & Telegraph Company and the Newport News and Richmond Telephone & Telegraph Company to do business in Williamsburg, Va. A maximum rate of $38 on business 'phones and $30 on private 'phones is required. The companies have not yet accepted the franchises but in all probability will.

There is talk of a telephone line to connect Hamilton with Barnesville, Bexar, Detroit and Sulligent, Ala.

The Massachusetts Telephone & Telegraph Company will probably become an operating company by December 1. The company now has 175,000 feet of duct laid in the streets of Boston, and a contract will soon be let for 40,000 additional feet, making a total of 215,000 feet, or 43 miles of duct, which will be available for use by November 1. The number of ducts in the conduits vary from 4 to 72, the larger number being on Franklin street approaching the central station. Connections are now being made from the conduits to buildings. The company has from 5,000 to 6,000 subscribers under contract. The switchboard to be used in the central station has arrived from Chicago and is being installed.

The first telephone exchanges, according to a Kansas City, Mo., paper, were established in 1878, and by the next year the telephone was coming into general use. The census of 1880 showed 148 different companies, with 34,305 miles of wire and 54,319 instruments. During the twenty years that have elapsed the Bell interests have seen consolidated into the American Telephone & Telegraph Company, which controls 62-,000 miles of wire and rents twenty one times as many instruments as were in use in 1880. Nearly four million exchange connections are made daily. In 1876 it was a remarkable feat when oral "dispatches" were transmitted between Salem, Mass., and Boston. Now Kansas City may call up New York at any time and may even talk with Boston, 1,700 miles distant by wire.

The Citizens' Telephone Company of Racine, Wis., will shortly commence work on the new plant. Material is now on the way. There was some talk of the city enforcing the conditions of the first franchise of Allen Shewmon, but as it was shown that Mr. Shewmon did everything in his power to get the plant in the $1,000 forfeit will not be demanded and he will get the extension asked. There are over 200 stockholders in the company, all Racine men, and they have 500 subscribers just as soon as the 'phones are ready for use.

The Manhattan Railway Company of this city, will equip all its stations along the four elevated lines with telephones, which are to supplant in part the telegraph for official business. A report that the telegraph was to be entirely abandoned by this company was denied recently by the superintendent, who said that for some purposes the telegraph was indispensable.

The New York Telephone Company is making extensive improvements in Mount Vernon, N. Y. A $36,000 four-story fireproof exchange is being erected in South Fifth avenue, and ten miles of conduits are being laid through the principal streets, at a cost of about $10,000.

The Rawson Electric Company of Elyria, O., known as the Home Telephone Company, recently deposited a certified check with City Treasurer Harrington for $5,000, constituting a bond to begin the construction and operation of a telephone exchange in Lockport, N. Y. The franchise was granted last June.

On the night of October 3d wire thieves cut seventeen of the wires running through West street of this city, the only street in the city where the wires of the telephone company are stretched overhead. Some of the wires cut were those of the Fire Department, and others were long distance wires of the New York Telephone Company, running to Chicago.

The Long Distance 'Phone Company of Virginia will put up a line between Richmond and Petersburg.

TELEPHONE INCORPORATIONS.

The Exchange Telegraph Company, Jersey City, N. J.—to operate telegraph and telephone lines. Capital stock, $5,000,000. Incorporators: A. Suedburg, Jr., L. B. Dailey, C. W. Perkins, E. J. Dudley, C. A. Barkley, K. K McLaren, H. S. Gould, W. W. Baldwin, T. Parker, J. I. Billings.

The Oakville Telephone Exchange Company, Oakville, Ia. Capital stock, $5,000. Incorporators: E. I. Dunham, J. C. Thompson, D. A. Brown, A. L. Duncan, L. C. Edwards, E. B. Conkling and S. R. Gowthrop.

The Grant County Telephone Company, Silver City, N. M. Capital stock, $30,000. Incorporators. Patrick T. McGrath, Adolph Wisel, William D. Murray, Edward A. Blanton, Jr., Joseph W. Bible, all of Grant County.

The Hornellsville Telephone Company, Hornellsville, N. Y. —to operate a telephone line between Hornellsville, Olean, Bath, Wellsville, and intermediate villages. Capital stock, $50,000. Directors: Burt G. Hubbell, Cleveland, O.; F. D. Sherwood and James B. Day, Hornellsville.

The Central Indiana Telephone Company, Sheridan, Ind. Capital stock, $10,000. Directors: John H. Cox, Dorval Cox and Leland D. Cox.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Ava, Ill.—R. J. Matthews is preparing to rebuild his electric light plant recently destroyed by fire.

Barnesville, O.—The arc lights lately erected are giving excellent satisfaction and there is now talk of increasing the number.

Batavia, N. Y.—George E. Crater, Jr., of New York will apply to the city council for a franchise for an electric lighting plant and electric railway.

Benton Harbor, Mich.—The city council is considering the question of erecting a municipal electric light plant.

Berlin, Wis.—The Berlin Electric Light Company lately decided to sell its plant in this city for $12,000. The system is to be remodeled.

Bronson, Mich.—Electrician Fredericks has purchased the outfit of the Bronson Electric Company and will take possession at once. He will begin the work of transforming it into an up to-date plant.

Carbondale, Ill.—This city contemplates the expenditure of $27,000 for the erection of an electric light plant.

Charleston, S. C.—W. I. Davids of the Charleston Hotel in this city invites bids for hotel electric lighting equipment.

Cumberland, Md.—The Baltimore & Ohio Railroad Company is arranging to establish a complete new electric light and power plant in this city, to light all the company's property.

Deerfield, Mich.—Deerfield's streets are to be lighted by electricity soon.

Denison, Tex.—Bids will be received by the American Cotton Spinning Company of this city for the installation of an electric light plant.

Devil's Lake, N. D.—This city will soon install an electric light system.

Fostoria, O.—This city may have another electric lighting plant soon. C. E. Palmer is at the head of a syndicate who want a franchise from the city council.

Galveston, Tex.—The city electric light plant wrecked by the recent hurricane will be rebuilt. D. Hall, superintendent can be addressed.

Hollins, Va.—The Hollins Institute will install an electric light plant for lighting its buildings and grounds.

Johnstown, O.—A movement has been started in this city to erect an electric light plant. Messrs. Swartz have asked for a franchise for lighting.

Kirkwood, Mo.—Bids will be received until October 16 for machinery, appliances and materials, and for the erection of an electric light plant. Address J. G. Hawken, city clerk.

Magnolia, Miss.—A stock company is about to be organized here for the erection of an electric light plant.

Marion, Va.—H. J. Palmer, of Washington, D. C.; A. J. Lincoln, O. C. Sprinkle, W. L. Dickerson, and others, of this place, have incorporated the Marion Light & Power Company, and will erect an electric light plant. The capital stock of the company is $10,000.

Montreal, Can.—This city is discussing the lighting of the city, as the present contract expires on December 31, 1903. A municipal electric light plant may be built.

Naperville, Ill.—Plans and specifications are being prepared for the erection of an addition to the electric light plant.

New Paltz, N. Y.—This village has voted to have the streets lighted again by electricity.

New York City.—Proposals for bids, or estimates for heating and ventilating apparatus and electric lighting plant, for new public school 122, will be received by the committee on buildings of the board of education at the hall of the board, southwest corner of Park avenue and 59th street, Monday, October 15.

Perry, La.—W. J. Davis is interested in the erection of an electric light plant in this city.

Philadelphia, Pa.—The Beck Company of 639 Spruce street, this city, intends to establish a combined ice and electric light plant in a town of about 5,000 inhabitants, and is desirous of securing a location in some Southern community.—The rumor of the sale of the plant of the Kingston Electric Company to a syndicate of this city has been confirmed through a reliable source.

Radford, Va.—The Electric Light & Power Company will make improvements which will cost $20,000. G. W. Miles is president of the concern.

Salem, Ore.—The Salem Light, Heat & Power Company was lately organized by F. R. Hanson, M. C. Anson and G. A. Rockwell for the purpose of operating an electric light and steam heating plant in this city.

Sea Isle City, N. J.—This city will erect an addition to its electric light plant. Thos. Ludlam, mayor.

Selin's Grove, Pa.—This place will vote on election day upon the question of increasing the debt of the borough for an electric light plant.

Spokane, Wash.—The Post Falls Electric Company will erect a plant to cost about $750,000. E. C. Riblet is making surveys and contracts will soon be let.

St. Edward, Neb.—This place is to have an electric light plant in operation in the near future.

STREET RAILWAYS.

Ann Arbor, Mich.—At a recent meeting of the council the ordinance committee submitted an ordinance granting a franchise to Messrs. Hawkes & Angus for the proposed electric railroad from Jackson to this city.

Auburn, N. Y.—It is thought the trolley line from this city to Skaneateles may be completed in four to six weeks.

Boulder, Col.—The scheme to build an electric railway from River Front Park to this city is being revived by J. Brisben Walker.

Clarksville, Ga.—W. S. Erwin and J. H. Hicks of this city are planning the construction of an electric railway between here and Nacoochee Valley taking in Porter Mills.

Durham, N. C.—A movement is on foot to connect this place and Chapel Hill by trolley. A company is to be organized to build the proposed electric line.

Fayetteville, W. Va.—A corps of civil engineers have been surveying the proposed route for the electric railroad from Fayette on the Chesapeake & Ohio Railroad to this city, the county seat, a distance of two miles. The road will be built at once by Baltimore capital.

Fonda, N. Y.—The Fonda, Johnstown & Gloversville Railroad Company has decided to equip all the cars of the electric division with Providence fenders, and orders are placed for a sufficient number to supply all the cars of the local and main lines.

Harrisburg, Pa.—A charter was lately granted in this city to the Apollo, Vandergrift & Leechburg Electric Railway Company, with a capital of $25,000. This company proposes to construct a trolley line four miles long from Apollo to Vandergrift.

Lafayette, Ind.—There is a probability that this city and Covington, or else Veedersburg, will be connected by an electric railway. A number of local capitalists have interested themselves and are pushing preliminaries.

Leesburg, Va.—C. C. Campbell, of Fairfax County, Va., and Mr. Henderson of Missouri, are the chief promotors of a company which has been organized with a capital stock of $300,000 for the construction of an electric railway from Washington west and northwest through Alexandria, Fairfax and Loudoun Counties. A power house to cost $60,000 will be erected on the farm of Mr. Campbell about eight miles west of Washington.

Lexington, Mich.—The Detroit, Lexington & Lake Huron Electric Railway Company has been granted a franchise by the township board for a road through this place to be completed by December 31, 1901.

Martinsville, Ind.—It was recently announced that work on the electric line to this place will begin November 1. The road will pass the main entrance to Bethany Park and through nine towns.

Monaca, Pa.—The borough council lately granted right-of-way for the electric line that is to connect this place with other Beaver Valley towns.

Oskaloosa, Ia.—Arrangements are being perfected between the mayor, members of the city council and those interested in the proposed company by which a new company is to be formed here for the purpose of building a street railway and operating an electric light plant. The officers of the company which will secure the franchise for the street railway and electric lighting system are W. M. Peatman, of Centerville, president, and C. Winter, of Oskaloosa, secretary.

Pontiac, Mich.—Geo. F. Fisher, president of the proposed Pontiac-Orion electric road, states that surveys have been completed, and that the road will be graded this fall and rails laid in the early spring.

Rochester, N. Y.—Promoters of the Ridge Road Electric Railway from this city to Buffalo say that they expect to be able to have the road in running shape in time to carry travelers to the Pan-American Exposition.

San Francisco, Cal.—Plans have been prepared by Superintendent Lynch of the Market Street Railway Company which will soon convert the cable railways into electric lines.

Toledo, O.—This city is to have another electric railroad tributary to intersect with the Traction Company's line.

MANUFACTURING.

Chicago, Ill.—The Chicago Electric Hose Company was lately formed here to manufacture hose and rubber goods and appliances on a capital of $200,000.—The Chicago Die & Electric Company was organized in this city for the purpose of manufacturing machinery, dies and electrical appliances with a capital of $5,000. Francis W. Maxstadt, Charles D. Cole and John Lyle Vette are all interested in the concern.

Knoxville, Tenn.—The Biddle Manufacturing Company of this city wants a 200 light, 110 volt dynamo, shafting, pulleys, 100 horse power boiler, 50 or 60 horse power automatic engine, etc.

New York City.—Philip Hartensfels and P. S. Homer of this city and W. R. Chipman of Jersey City are the directors of the Electro Purification Apparatus Company recently formed here to manufacture appliances for the purification of water and other liquids on a capital of $50,000.

COMPANY MATTERS.

Ashland, Ky.—The Ohio Valley Electric Company will expend in the neighborhood of $200,000 on improvements in this city. The power house here will furnish light for the cities of Ironton, O., Catlettsburg and Ashland, Ky., and Huntington, W. Va.

Brooklyn, N. Y.—With a view to improving the service, the Brooklyn Rapid Transit Company has reorganized its elevated railroad system into six divisions, instead of three, as heretofore. Each division will be under the control of a division superintendent, who will be responsible to General Superintendent Edwards.

POWER AND TRANSMISSION PLANTS.

Altoona, Pa.—City Engineer Linton of this city has secured right for water power at Loysburg, 25 miles south of here, to develop 6,000 horse power to be used for lighting and power and to operate a proposed electric railway from Hollidaysburg to Hopewell.

Brandon, Manitoba.—The Brandon Electric Light Company is now building a dam and will soon commence the erection of the power house and pole line.

Fort William, Ont.—E. B. Douglass, president of the Sault Ste. Marie Pulp & Paper Company, has planned a proposition to develop Kakabeka Falls, near this place, for electric light and power purposes.

MINES.

Denver, Col.—A Ball electric 10-light plant, with enclosed arc lamps of 2,000 candle-power, has been ordered for the Camp Bird mine. It will be used for lighting the grounds in the vicinity of the mine and mill. In all its phases the Camp Bird mine is probably the best equipped in the country and this addition to its electrical plant makes it virtually complete in every detail.

Montreal, Can.—The water committee has decided to call for tenders for the proposed electric motor plant for the high level reservoir. It is intended to have everything modern in this line of work. Canadian and American firms are expected to send in tenders, but the committee does not bind itself to accept the lowest or any of them. It will be arranged so that electric power may be obtained from any of the companies in Montreal.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Oct 8						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5 000,000	1¼ % Q.	117	119
Allentown Pa.—Oct 8						
Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn.—Oct 8:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Oct 8:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—Oct 8						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co...com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co...pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co...com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	98	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	145½	146
Brooklyn N. Y.—Oct 8:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	282	284
Brooklyn Rap. Transit Co., tr certf.	100	48,000,000	48,000,000	....	51¾	51⅞
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR....guar	100	12,000,000	12,000,000	8½ % Q., Jan.,	287	289
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	822	825
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad...pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. B. Railroad	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Oct 8						
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.—Oct 8						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.—Oct 8						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Oct 8						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	212	214
Chicago & South Side R. T. RR.	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR.	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	Feb 28 1900.	3	30½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	81	81¾
North Chicago Street RR.	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR.	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	101
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry...com	....	1,250,000	624,900	85 %	10⅛	11
Union Traction Co...pref	100	2,000,000	2,000,000	5 % S.	46¾	47
Cincinnati, Ohio.—Oct 8:						
Cincinnati Inc. Plane Ry...com.	50	1,000,000	875,000	....	..	..
Cincinnati Inc. Plane Ry...pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—Oct 8:						
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	87	88
Detroit, Mich.—Oct 8:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Oct 8						
City Railway Co...com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co...pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	..	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Oct 8						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Oct 8						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Oct 8.						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %,	150	.
Indianapolis, Ind.—Oct 8.						
**Indianapolis Street Ry	...	5,000,000	5,000,000	....	24	24½
Lancaster, Pa.—Oct 8						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Oct 8						
Louisville Ry...com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry...pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Oct 8						
Twin City Rapid Transit...com.	100	17,000,000	15,010.000	....	68⅝	68¾
Twin City Rapid Transit...7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—Oct 8						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	267	297¼
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¼ % S., J. & J. †	100¾	109¼
Memphis Tenn.—Oct 8:						
Memphis Street Railway Co	100	500,000	500,000	....	25	--
New Haven, Conn.—Oct 8:						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	..
Winchester Avenue RR.	25	1,000,000	600,000	....	45	46
New Orleans, La.—Oct 8						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR...guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR...guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	--
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Oct 8:						
Central Crosstown RR.	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR...guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q. Nov.	120	185
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	148⅞	149
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	32	36
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2½ % Q.	192	200
h Eighth Avenue RR.	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR...guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co...guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR.	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Oct 8:						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	....	57	60¾
North Jersey Railway Co.	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey	100	504,000	504,000	11¼ % A.	16	19
Pittsburg, Pa.—Oct 8:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co...com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co...pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co.	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72½	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co.	50	2,500,000	1,900,000	3½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry.	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co.	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry.	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry.	50	†3,000,000	3,000,000	5 % A., June	..	..
United Traction Co...com	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co...pref	50	3,000,000	....	J. & J.	51⅜	51⅝

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Oct 8						
Union Street Railway Co..	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Oct 8						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Oct 8:						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Oct 8:						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Oct 8:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Oct						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '19	28	24
Hestonville, Man. & Fairmount....	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co........... $12½ pd	50	30,000,000	29,980,450	....	36⅞	37
*c*Electric Traction Co.	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co.	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry....	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry....	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	95¼	98½
*j*Catherine & Bainbridge St.....	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar..	50	1,000,000	‖580,000	$6 share—July, '98.	153	157
Empire Passenger Ry. Co......	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry.....	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR..	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry....	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar...	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co......	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry....	50	750,000	‖750,000	$10 share, July '98	262	268
Rochester, N. Y.—Oct 8						
Rochester Railway Co.	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Oct 8						
*j*Reading Traction Co.	..	1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26
*k*City Passenger Ry.	50	850,000	850,000	Jan., '98.	133	...
*l*East Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Oct 8						
Fourth Street & Arsenal Ry.	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan.,'99.	--	--
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds....	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co.	50	1,000,000	300,000	50c., Dec., '89.	--	--
United Electric Ry............com.	50	500,000	500,000	....	20	21
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Aug.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Oct 8:						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Oct 8						
Springfield Consolidated Ry	100	750,000	750,000	....	----	--
Springfield O.—Oct 8						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Oct 8:						
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Oct 8						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S. §	100¾	102¼
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Oct 8						
Belt Ry. Co.	50	500,000	500,000	....	--	--
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co.	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	20	21
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Oct 8						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	30	31½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Oct 8:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1 %, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866–7–8 p.a. $20,000 in 1899–1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 8						
American Bell Tel Co.	100	50,000,000	23,650,000	4½ % Q., Jan.	138	140
Erie Telegraph & Telephone Co....	100	......	......	1 % Q., Feb. 20,	95	95
New England Telephone Co.	..	10,894,600	10,804,600	$1.50 p. sh. Feb	123½	125
New York.—Oct 8						
American Telegraph & Cable Co...	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.....	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co.	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co.	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co...	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99.	79	79¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Oct 8:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co.	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	116	125
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 8:						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	137	137¼
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Oct 8						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co.	100	......	......	....	8	12
Electric Vehicle Co..............com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900.	137	137¼
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	..
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Oct 8						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.	50	800,000	800,000	Q	--	--
Philadelphia, Pa.—Oct 8						
Edison Electric Light Co.	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	50	60
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	55	65
Northern Elec. Light & Power Co..	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Oct 8						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co.	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.	100	......	......	....	118¾	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	1 % Q ‡	198	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1¾ % Q	133¼	135
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1, 96.	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Oct 8:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Oct 8:						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Oct 8						
Electro Pneumatic Trans. Co.	10	1,500,000	......	----	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	----	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co.	5	525,100	......	....	48	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1½
Pittsburg, Pa.—Oct 3						
Carborundum Mfg. Co.	100	200,000	200,000	....	--	..
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Oct 8						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co.	25	......	......	....	82	--
Consol. Car Heating Co.	100	1,250,000	1,250,000	1½ % Feb	55	58
Johns-Pratt Co.	100	....	....	----	105	109
*Pratt & Whitney Co...........com.	100	......	....	----	2	4
*Pratt & Whitney Co............pfd	100	....	......	----	40	50
Stillwell-Bierce Co..............com.	--	....	....	----	--	50
Stillwell-Bierce Co...............pfd.	--	....	....	2 % Sept 1,'99.	70	65
Shultz Belting Co.	100	500,000	....	....	80	90
St. Charles Car Co.		....	....	......	99	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Oct 8, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1940	J. & J.	*118	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*117	......
‡Watervleit Turnpike & RR.1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127⅛
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Oct 8, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co.No. Balto div.1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M.& N.	104⅛	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry.............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry .Co.

Chicago Ill.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T...............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
‖W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‖Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114⅛
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked a.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s	100,000	24,000	1912	M & S	......	....

*With interest. ‡Unlisted.

New Orleans La.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	‡$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Oct 8, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	101	102⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109⅛	.....
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98⅛	100⅛
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
‡D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.).......1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	......	110⅛	112⅛
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128⅛
Twenty-third Street Ry......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Oct 8 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Oct 8, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry......................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	....	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry..............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	-- --	......
West End Passenger Ry....... 1st mtg. 7s.	....	....	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg. Pa.

Date of Quotation—Oct 8 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	---	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	.....
Second Ave. Traction Co.....................5s.	2,500,000	2,039,000	1934	J. & D.	......	.....
Sub. Rapid Transit Railway Co.........6s.	500,000	500,000	1919	M. & S.	......	.....

Providence R. I.

Date of Quotation—Oct 8, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry...................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Oct 8, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101⅛	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101⅛	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J&—	17	

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*— Oct 8, 1900						
Jefferson Avenue Ry..........1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co..........1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..........1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co..........1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co..........2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co..........Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co..........1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry..........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry..........Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co..........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
§$200,000 in escrow to retire 1st & 2d mtg.
‖$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co..........1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..........1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR..........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..........1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry..........1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..........1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation*— Oct 8 1900						
Belt Ry. Co..........Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home..1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*- Oct 8, 1900.						
Bridgeport Traction Co..........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,866,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry..........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	3,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry..........1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry..........Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry..........Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Oct 8 1900						
Delaware Gas Lt. Co.,..........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,046,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*— Oct 8, 1900						
Allegheny County Light Co..........6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Oct 8, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s	8.000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*— Oct 8 1900.					100½	101
American Bell Telephone..........4s.			1908	F. & A.	......	....
Northwestern Telegraph Co..........7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	103	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 8, 1900						
American Electric Heating..........7s.	500,000	500.000	....	....	....	......
Armington & Sims Engine Co..........	....	....	......		......	25
Barney & Smith Car Co..........6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........6s.	......	....	1904	J & D.	......	......
Worthington Pump Co..........	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16⅝c.; Lake, 16⅝@16¾c.; casting, 16⅜@16½c.

A dividend of 2 per cent. has been declared on the United States Rubber preferred stock, payable October 31.

An interest in the new $30,000,000 National Telephone Company says that no steps toward more definite organization will be taken until after the election.

The Lowell, Lawrence & Haverhill (Mass.) Street Railway Company has petitioned the railroad commissioners for authority to consolidate with the Lowell & Suburban.

According to the Boston "News Bureau," arrangements are being made whereby the City of Chicago will light its streets by an electric plant owned by the city.

Earnings of the Chicago Union Traction Company for the last part of September show improvement over the first part; the increase for the month, it is stated, is over $5,400.

The Brooklyn Rapid Transit Company is considering a plan for the readjustment of bonds to gain the advantage of the premium on some of the issues. The profit to the company, should the plan succeed, would be in the neighborhood of $300,000.

At the meeting of the directors of the Chicago Union Traction Company on October 4, the old officers were re-elected. A dividend of 1½ per cent. was declared on the preferred stock, payable October 25. Books closed October 5 and reopen October 25.

The earnings of the Montreal Electric Street Railway, for the past year, show another substantial increase in income, the figures, as compared with the previous year, being for 1899: $1,646,647 and for 1900; $1,762,220, thus making the past twelve months by far the biggest year in the history of the company.

The active Lake Superior copper mining companies have about 14,000 shareholders, owning stock worth nearly $140,000,000, and which paid dividends in 1899 of $12,318,000. This gives an average investment of about $10,000 and an average income annually from copper dividends of about $900. Two-thirds of this stock is owned in Boston and its suburbs.

The Brockton (Mass.) Street Railway Company has filed a petition for authority to issue $400,000 bonds, also to purchase the West Roxbury & Roslindale, and the South Shore & Boston Street Railway Companies. The company also desires to issue $1,665,000 additional capital stock to exchange for the stock of the companies to be purchased.

The Metropolitan Street Railway Company of New York announces that it has finished all of the street work it will do this year. The company has spent about $5,590,000 for the most part on the power houses and motive power changes. Nine miles of Lexington avenue have been equipped for electric traction; six and a half miles of Columbus avenue have been electrically equipped; ten and a quarter miles of Broadway road have had new rails set, and the street surface repaved, and three crosstown lines have been reconstructed. President Vreeland says there is no intention of operating the present cable line by electricity until next spring, by which time he hopes to abolish the whole cable service on the Metropolitan lines.

The New England Electric Vehicle Transportation Company has had a very prosperous summer considering the small number of vehicles in operation. It has 100 cabs in operation in Boston and 50 delivery wagons and will probably not add to this equipment this winter. It has equipped its main station in Boston with apparatus for automatically charging the vehicles, which will effect a considerable saving in operating expenses.

The Metropolitan Street Railway Company of New York reports to the State Railroad Commission the general balance sheet of its system, as of June, 30, 1900, as follows: Third Avenue—Cost of road, etc., $25,165,505; stock of other companies, $9,636 497; bonds of other companies, $306,150; open accounts, $20,655,338; profit and loss deficiency, $282,309; total, $56,045,800. Liabilities—Capital stock, $15,995 800; funded debt, $40,000,000; real estate mortgage, $50,000; total, $56,045,800. Twenty-third Street—Dividends, 108,000; betterments, $362,424. Balance sheet—Assets—Cost of road, etc, $2,435,421. Liabilities—Capital, $600,000; funded debt, $400,000; due lessee company for additions and betterments, $874,356, bills payable, $500,000; profit and loss, surplus, $61,064. Forty-second Street and Grand Street Ferry—Dividends, 18 per cent., $134,640; rental under lease, $134,640; betterments, $500. Balance sheet—Assets—Cost of road, etc., $1,032,620. Liabilities—Capital, $748,000; funded debt, $236,000; Metropolitan Street Railway Company, $500; profit and loss surplus, $48,620. Dry Dock, East Broadway and Battery—Betterments, $4,575; gross earnings, $632,906; operating expenses, $459,809; other income, $6,036; fixed charges, $131,740; net income, $47,392; sundry charges, profit and loss, $15,335; total surplus June 30, $7,875. Broadway and Seventh Avenue—Rental under lease, $210,000; dividend 10 per cent., $210,000. Balance sheet—Assets—Cost of road etc., $13,332,775; open accounts, $52,500; total, $13,385,275. Liabilities—Capital stock, $2,100,050; funded, $9,650,000; dividend unpaid, $52,500; due lessee company for betterments and additions, $1,582,775. Bleecker Street and Fulton Ferry—Rent under lease, $13,500; dividend 1½ per cent., 13,500. Balance sheet—Assets—Cost of road etc., $1,801,931; bond extension account, $30,501; total $1,832,432. Liabilities—Capital, $900,000; funded debt, $700,000, Metropolitan Street Railway Company, $30,501; profit and loss surplus, $201,931. Central Park, North and East River—Betterments, $557,339; rental under lease, $162,000; dividend 9 per cent., $162,000. Balance sheet—Assets—Cost of road, etc., $4,048,863; profit and loss deficiency $189,132; total, $4,238,695. Liabilities—Capital, $1,800,000; funded debt, $1,200,000; due lessee company for betterments and additions, $1,238,695. Second Avenue—Betterments, $5,329,390; rental under lease, $148,960 dividends 8 per cent., $148,960. Balance sheet—Assets—Cost of road, etc., $8,194,413; profit and loss surplus, $77,686; total, $8,272,000. Liabilities—Capital stock $1,862,000; funded debt, $6,410,000.

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ELECTRICITY.

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EDITORIAL NOTES.

The American Street Railway Association Convention.

As we go to press the Nineteenth Annual Meeting of the American Street Railway Association is being called to order in Kansas City, Mo. Although the latter city is considerably further West than Chicago, where the Association met last year, it is expected that the attendance will be unusually large, and that the exhibits will be most attractive. There are certainly advantages in having the Convention held so far West, in that many small Western street railway companies will be offered an opportunity of being represented at the meeting, which would probably not be the case were the meeting held in the East.

As usual the papers to be read at the Nineteenth Annual Meeting are few in number, but on subjects that should prove of great interest to the street railway industry. The paper entitled the "Comparisons of the Various Systems of Electrical Distribution for Street Railways," should elicit an interesting discussion, as well as that on the "Consolidation of Street Railways and Its Effect Upon the Public."

The last day of the Convention, or October 19, will be given up entirely to an examination of the exhibits, which will embody the latest and most up-to-date appliances made use of on street cars or in connection with the street car service. On this same evening the annual banquet will be held when the officers-elect will be installed.

Judging from the number of well-known street railway men who have gone from this vicinity to the Convention it should prove a success. The proceedings of the meeting will be found in our next issue.

* * *

What is Being Done in the Line of Wireless Telegraphy.

There would seem to be considerable activity these days in the line of wireless telegraphy. The leading naval powers of the world are carefully keeping track of any improvements in the apparatus or method of transmitting signals, while only recently the British Admiralty is said to have ordered from the company, of which Marconi is the head, 30 complete sets for the use of the navy. The demand for wireless telegraphy apparatus on the ships of the English fleets, is due to the fact that during some recent naval manœuvres wireless messages were successfully transmitted 100 miles. For each installation of apparatus the British Government pays Marconi or his company $1,000, whereas a year or so ago he wanted $10,000 royalty, and $10,000 for each set of instruments installed on ships of the United States Navy.

It is understood that the Navy Department regards the rate of $1,000 as reasonable, and will make overtures to Marconi with the hope of securing a number of sets of instruments for use on the ships of this navy. Should an arrangement be effected the vessels of the North Atlantic squadron will be the first to receive the instruments. The experiments conducted in this country with Marconi's apparatus, as well as the excellent results obtained by the use of wireless apparatus on ships of the British Navy have convinced the Navy Department officials that wireless telegraphy would be of value to ships at sea.

Ever since wireless telegraphy was discovered to be practicable, Marconi has been endeavoring in every way to improve his apparatus and method of transmitting signals. He has been at work for some time devising a means of concentrating the waves that emanate from the transmitter, so that the receiver for which the message is intended, and that alone will be affected. His method of doing this has as yet not been entirely perfected, but will be in the near future, so it is understood. Another invention is that of transmitting messages over long distances without the use of the vertical wire, which has up to now been considered absolutely necessary. In a recent experiment Marconi succeeded in sending a message from Boulogne, France, to Dovercourt, England, a distance of sixty miles, by the use of a cylinder but four feet high, instead of the hundred foot vertical wire. This is on the belief, as expressed by M. Willot, chief inspector of the French telegraphs, that the messages leave the bottom and not the top of the poles, and that therefore the height of the vertical wires does not affect the distance a message can be sent.

As the Hertzian waves radiate from a transmitter, in much the same way that the waves of a quiet pond do when its surface is disturbed by the throwing in of a stone, it is rather difficult to see if, as has heretofore been generally believed, ether waves are responsible

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for the transmission of a dispatch, how the curvature of the earth is to be overcome, and a wireless message recorded over a long distance, unless a vertical wire is used. Especially would this seem the case where a message is sent across a great expanse of water, as between ship and ship, where the water acts as a shield. However, if it is found that the vertical wires can be omitted and replaced by short cylinders, it will materially simplify the installation on board ship or elsewhere of wireless telegraphy apparatus.

* * *

A German Automobile Exhibit. American automobile manufacturers will be interested to learn that there has been organized in Berlin a permanent exhibition of automobiles, which will offer exceptional facilities for the motor vehicle builders of all countries to bring their products before the people of Germany under highly advantageous conditions, and at minimum cost. The association includes among its founders several prominent capitalists and business men of Berlin, its officers are men of the highest character and social position, and its purpose is not to make money, but to provide a permanent, legitimate basis of encouragement to the motor-vehicle industry in Germany, and to automobilism as an adjunct of sport, business and recreation. The managers of this enterprise realize fully that German manufacturers are as yet in some important respects behind those of France and the United States; they appreciate the advantage that will result from bringing the leading motor vehicles of all countries into practical, side-by-side competition, and they therefore offer to foreigners and their machines precisely the same privileges and conditions that are vouchsafed to those of their own country.

The association is a limited stock company, entitled "Die Automobil Ausstellung," with offices at No. 6 Dorotheen strasse, and exhibition grounds and driving school on Georgen strasse, Berlin. The space for permanent exhibits includes 1,200 square meters (12,902 square feet), with offices and all the features of a well arranged exposition. Floor space will be rented to exhibitors at a uniform half-yearly rate of $47.60 per square meter, with $14.28 per meter for wall space to be used for advertising purposes. This will be the only expense involved, no commission or other charge being made for vehicles sold when on exhibition or from samples there displayed. The space rates above stated will be reduced proportionately when the term exceeds six months. Vehicles and other articles on exhibition will be guarded by agents of the company, which will, when requested, effect fire insurance on exhibits at the expense of the owner.

It should be understood that the association is not commercial, and can not accept the business of selling, on commission or otherwise, the motor carriages or materials exhibited by any manufacturer, native or alien, but it will, when requested, recommend to foreign makers firms or individuals of good standing as agents in Germany, and its recommendation in this respect will be a high testimonial to the character and responsibility of the party recommended

An illustrated catalogue of all exhibits will be issued and corrected from time to time so as to include new articles received for display. The public will be admitted gratis to all parts of the exhibition, which will thus become a permanent, open, international business display of motor vehicles and parts and materials pertaining thereto, classified as follows: Motor cars of every description for conveying passengers; motor vehicles for the transport of goods; motor cycles and tenders for use with the same; accessories for motor-driven vehicles, fittings, tools, etc.; books on the subject, drawings, models, etc.; articles connected with the manufacturing, etc., of motor cars, etc.

That this permanent exhibition will meet an obvious want and exert an important influence in developing automobilism in Germany is beyond any reasonable doubt. There are today in Berlin and its outlying suburbs scores of persons—physicans, lawyers, and other professional and business men—who are ready and anxious to purchase an automobile, but not being mechanics or thoroughly informed on the subject, they distrust their own judgment and hesitate to buy lest they may find with experience that they have chosen unwisely and paid a high price for an inferior machine.

The permanent exhibition will give intending purchasers an opportunity to examine and compare side by side motor vehicles of all classes and nationalities, propelled by steam, hydro-carbon and electrical motors, to see them tested in competition with each other, and when a machine is chosen the buyer will be taught by an expert to understand and manage it. Numerous applications for space have already been received from French and Belgian makers, so that the exhibition will assume from the first an international character.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE National Electric Light Association has recently published a pamphlet of seventy-five pages, giving the results of experiments, which have been in progress for the last year at the Purdue University electrical laboratories at Lafayette, Ind. The object of this extensive research was to devise a method for determining the efficiency of the arc and incandescent lamps. The experiments by Purdue experts are of great interest to the public, for if they are successful it will be possible for the consumer to tell whether he is getting the amount of lighting power for which he contracts.

THE Free Public Library trustees of Newark, N. J., have granted to the Crocker-Wheeler Electric Company and the Watts-Campbell Engine Company a contract for installing in the new library building on Broad street a complete electric lighting plant. It is the intention of the trustees, if possible, to have the plant in working operation by December 1.

THE nominating committee of the Automobile Club of America announced the regular ticket October 10 which will come before the members for election at the annual meeting, Tuesday evening, October 23. The meeting will be held in the club rooms at the Waldorf-Astoria in this city, and early in November the club will take possession of its new rooms in the Astor Court Building. The officers nominated for the coming year are: President, Albert R Shattuck; first vice-president, Gen. George Moore Smith, second vice-president, J. Dunbar Wright; third vice-president, David Wolfe Bishop; treasurer, Winslow E. Buzby; secretary, Whitney Lyon; governors for the class of 1903, Albert C. Bostwick, Charles P. Doelger, and Dave H. Morris.

THE re-equipment of the electrical laboratories at McGill University at Montreal, Can., which was begun in the fall of 1898, following the munificent gift of Sir Wm. Macdonald, has been completed during the past summer. The dynamo laboratory, where the students carry on their experimental work, is divided into two sections, one for direct, the other for alternating current work, and is perfectly equipped with the latest types of electrical machinery. The machines are placed on raised platforms, and overhead travelers enable them to be placed wherever required. Switchboards are provided for current distribution, the electricity being obtained not only from the generating plant of the university, which is itself a veritable central station, but from outside electrical companies as well.

CONSUL HUGHES sends from Coburg some interesting facts about electricity on German farms. Near Ochsenfurt, in Bavaria, a company composed of landowners and small farmers has been organized for the establishment of an electrical system for use on their farms and in villages. The power is to be generated by steam and water and the current distributed from a central station to the places at which it is wanted. Sub-stations are to be established at given points, with the necessary apparatus for connecting with the farm or other machinery and also for lighting purposes in the houses, offices, roads and village streets.

NEWS from Virginia City, Nev., states that the machinery for the electric power to run the Comstock mines was tested recently and found to work perfectly. The mills will be run by electric power this week and a big celebration will commemorate the event.

THE new electric plant is in full operation at the Reward mine, in Nevada County, Cal. The mine has been pumped dry of water, sinking has been resumed in the shaft and two more pumps will be added to the mill.

A NEW light has recently been placed in the lighthouse at Pendeen, on the north west coast of Cornwall, England. The light gives four flashes in 15 seconds and has an intensity of 57,000 candle power.

THE first electric train of the Manhattan Elevated Railway Company is now at the company's shop. It consists of six handsome cars, a motor car being at either end of the train. The company has not announced yet when the trial will take place.

AN entirely new departure in the method of furnishing power to the mining companies, for the purpose of running hoists, pumps, drills and other mining machinery, will characterize the extensive power plant to be erected at Post Falls, Wash., by the new company which has been organized at Spokane. The power-house will contain dynamos capable of generating 12,000 horse-power, with four units of 3,000 horse-power each. Thirty thousand volts will be the pressure regularly maintained on the power line. An immense central plant will be installed at Gem, Idaho, which will generate

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many thousand horse-power of compressed air. This compressed air will then be piped to the mines for the purpose of running their machinery, and, besides being a new feature in furnishing power, it will also institute a great reduction in the cost of operating.

The E. P. Allis Company of Milwaukee, Wis., has recently closed a contract with the Government of New South Wales, Australia, for three engines for generating electrical energy for traction purposes, to be erected in the power-house of the electric tramway at Sydney. These engines are to be of the vertical direct coupled pattern similar in design to those erected in the power house of the Milwaukee Street Railway and in the power house of the Metropolitan Company of this city.

There is about to be constructed at Budapest, Hungary, at the expense of the Government, a telephone exchange. This station will have a capacity of 10,000 subscribers at first, and will be so designed as to enable it at some future date to care for 20,000 subscribers. Firms of any nationality may submit bids for the work.

The idea of combining an ordinary home exerciser with an electric machine, so that the stimulating effect of electricity is obtained in combination with the muscular exercise, has recently been conceived by a company in Wisconsin. In appearance the machine resembles the ordinary exerciser with elastic cords passing over pulleys. But the cords serve as conductors, and the handles as electrodes. Somewhat below the middle of the board on which the pulleys are fastened, a cell is placed, and wired to an induction coil, secured to the upper part of the board. The induced current is conducted through the elastic cords, to the handle and back again. A metallic foot plate, furnished with the apparatus, can be placed in the circuit, so that the current may be passed completely through the body, if desired.

The pressing necessity for the reorganization of the army on modern lines is pointed out in the annual report of Major General John R. Brooke. Among other things Gen. Brooke commends the system of wireless telegraphy established by the signal service, and says that plans should be perfected immediately for complete and perfect communication between the units composing each fortress and the fortress commander.

Clarence W. Dolan lately returned to Newport, R. I., to make a test of a new electric automobile that he has had made for touring purposes. It is constructed both for speed and endurance, and is long and narrow, so as to offer as little resistance to the atmosphere as possible. It will run 120 miles without being recharged, and is designed for an average speed of twenty-five miles an hour.

G. A. Wiese, of Alameda, Cal., who went to China some years ago to install an electric light system for the city of Canton, had some interesting experiences with the Chinese. "In many places," he says, "the streets of Canton were too narrow for poles. We had to get permission of the authorities to cut holes in the walls of the buildings. Into these holes modern cross-arms were inserted. After the cross-arms had been placed and the wires strung we made a tour of inspection and were astonished to find that the wires were loaded with laundry work that had been hung out to dry. A current of 1,000 volts was running through the wires at the time, but luckily no one had been killed. When the Chinese were warned of their danger they only laughed and said that the electricity dried their clothes much quicker than the sun, so they refused to move their wash. Mr. Wiese finally had to report the matter to the authorities, who detailed a guard of 40 soldiers to go with him and put an end to the clothes-drying.

That business gentlemen in England should, on using a telephone and finding that they have been put on to the wrong number or switched off suddenly in the middle of a conversation, protest in a very vigorous fashion, is now a standard joke, says the London "Electrical Engineer," but the anger exhibited does not usually go farther than words. The hasty temper of the Spanish race is proverbial, but one would not think that any man, however angry, would do deadly injury to a telephone instrument. This, says our contemporary, is what occurred recently in Paris, when a Spaniard, who had been switched through by telephone from his hotel in Paris to a stranger instead of a friend, lost his temper and fired four shots into the instrument, entirely wrecking it. Naturally he had to pay heavily for repairs and also to leave the hotel.

The early development of the lignite coal fields has been promised the people of North Dakota at Wilton, the first station on the line of the Bismarck, Washburn and Great Falls Railway. An equipment consisting of a steam engine and an electric plant has been bought by the railroad company and the new machinery will be installed in the mines. The principal advantage in the new apparatus is the increased capacity of the mines which its use makes possible. Two electric cutters, machines for sawing the coal out of its beds, will be put in operation as soon as the machinery is set up. These two cutters will enable the operators to mine about 400 tons of coal per day. The machinery has power sufficient to drive six of the cutters, and as the company is away behind in orders, the satisfactory installation of the plant is the only thing necessary to run the electric devices to their full capacity.

I. N. Bettison, superintendent of the city water works of Brenham, Tex., has invented a device, and applied for a patent, intended for use on railway engines provided with electric lights. As constructed at present these lights are not adjusted to curves, and on a piece of crooked track the light falls either to the right or left of the rails. Mr. Bettison's device is arranged so that the engineer by a simple movement of the hand can make the light follow the rails, regardless of curves.

C. W. Price of the Montauk Multiphase Cable Company, who has been ill for the past seven months, is now quite recovered, and can be seen at the office of the company, 100 Broadway, New York.

An installation of electric traction has been made by the Société de Traction Electrique su Voies Navigables along a distance of about 47 miles, from Béthune to L'Escaut, in France. The boats to be drawn carry from 270 to 300 tons, and draw about 5 feet of water. The piece of canal fitted has six locks. The cost of steam traction or animal haulage, says the "Electrical Engineer," London, is .427d. per kilometric ton; for electrical haulage this is reduced to .285d. The actual length of canal fitted for electricity is about 16 miles, and this is effected by two stations about 6¼ miles distant from each other, and having installed a total power of 400 hp. Continuous current at 500 volts is produced by eight generators. Overhead wires are hung on posts about 44 yards distant from each other at a heigth of 21½ feet above the towpath. The tractive apparatus consists of about 30 electrical haulers, each weighing two tons and mounted upon four wheels, of which only two are driven. The length of the haulers is about 14 feet, the breadth being about 4½ feet. The electric hauler can easily draw two 300-ton barges at a speed of nearly two miles per hour.

The "Elektrotechnisher Anzeiger" thinks one outcome of the progressive improvement of accumulators will be that electrically propelled boats designed to accommodate from 100 to 150 passengers will prove dangerous competitors of steam-driven boats. The insignificant attendance required, involving no stoking, absence of smoke, and the possibility of attaining very high speeds, are all points in favor of their extensive introduction. At the same time, it must be remembered, that the wear and tear of accumulators employed for boat propulsion is much less than in the case of road traction, since the concussions so detrimental to the life of the plates is almost entirely absent. It is also to be anticipated, considers our contemporary, that one will depart in the future from the principle of providing services of large steamers at long intervals—because small steam-engines work less economically—in favor of running small boats at short intervals.

The "Union" presses of Port Jrevis, N. Y., are now running by electric power. The motor is of 12-horse-power, and gives double the power it really needs. Heretofore the power (water) has been insufficient to run all the presses at one time, but this new motor sends every machine, which includes two very large presses, two smaller ones, and a large folder with all the speed desired, and all at the same time.

A telegraph line has been completed between Seattle, Wash., and Skagway, Alaska, and put into operation. The route is from Skagway to Atlin, thence over the old Atlin-Lillowit line to the Fraser River, thence to Ashcroft and on to Vancouver, from which place it runs to Seattle. The line between Skagway and Vancouver is that which the Canadian Government has been engaged in constructing for the past four months.

Bids have lately been asked of several leading electrical engineering firms for equipping an extensive electric power-supply plant in the Mysore (India) gold mining district. Current is to be generated at the Convery Falls and conveyed 100 miles to the gold mines. The Mysore Government is to defray the cost of the installation.

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SHOULD THE USE OF GROUND WIRES IN CONNECTION WITH FIRE ALARM TELEGRAPH BE DISCONTINUED?*

BY MORRIS W. MEAD.

I have been unable to get time enough to prepare a lengthy paper upon the subject assigned, on account of the Annual Convention of the International Association of Municipal Electricians' meeting this year in my own city of Pittsburg, and being one of its officers, a large portion of the work has fallen upon myself to carry through. This, I feel, will be sufficient excuse for the short and summary way of presenting my thoughts upon the subject.

The paper which I have the honor to present to this convention, it seems to me, is of considerable importance to those having charge of municipal telegraphs, that is fire and police signal systems, upon the security and the reliable operation of which so very much depends, and any suggestion or discussion that will in any way tend to maintain the integrity of such service is, I am sure, of very great interest.

We all know how very undesirable it is to have grounds, or escapes, leakages of any kind occurring to fire and police telegraph circuits and the liability to troubles always existing from these sources, and any improvements or methods that will tend to avoid these indicated troubles, certainly help to remove a portion of that constant anxiety always in the minds of the parties in charge.

One of the important questions in my mind refers to the matter of maintaining permanent ground connection in police and fire alarm signal boxes, and whether or not it is desirable to have such boxes permanently connected with the ground, as has been the general custom.

Before the advent of heavy currents, such as electric light and trolley currents, there was no objections to a good ground connection permanently maintained at all signal box points of the kind indicated, but since the development of electrical currents of high voltage or in large quantities, it is certainly a very different matter, and I have come to the conclusion that it is safer to fire and police systems to be without a permanent ground connection at such points.

Of course we all understand the convenience that a ground connection furnishes when testing a fire or police signal system or when an "open" occurs, and I do not mean to convey the idea that ground wires are not desirable under certain conditions, but while I recommend having a good ground wire connection at all box points, I also believe it is not desirable to connect this wire permanently but instead to have it so arranged that it may be conveniently connected to the circuits when it is necessary to do so for any purpose.

One of the principal uses of a permanent ground connection at all signal boxes was to protect the box from lightning discharges, but the system now in general vogue of having fuse protection on all circuits, and grounded bars or plates at headquarters, it seems to me furnishes satisfactory protection in that particular respect, and therefore a ground wire lightning arrester is not really necessary to protect the system at such points, as was the case in former times when fuses were not so generally used as now.

Investigation on my part has led me to believe that very serious trouble has very frequently been introduced into fire and police telegraph circuits because of ground wires permanently connected at box points, and the trouble introduced into the system because of leakages from trolley or other heavy current, or escapes existing in water or gas mains and in that way brought into the system, which have caused very serious harm.

I have been told upon several occasions fire-alarm circuits have been found supplied with considerable current in that way although entirely disconnected from the battery operating such circuits, and undoubtedly this outside current has been brought into the circuits through the ground connection at the box points. This illustrates only one of the dangers occurring from such methods of construction. Another serious harm likely to ensue from these permanent ground connections is caused by heavy current wires coming in contact with wire and police wires, and owing to faulty causes at the ground plate in the signal box grounds or partial grounds have been left and serious burn-outs have occurred on that account to the system in use in such places. It is quite difficult to keep the spark-gap space thoroughly well insulated between the ground plate and the main line terminals on the lightning arrester used, and in that way frequently harm has been caused.

I understand that quite a number of fire-alarm superintendents have given this matter very careful consideration, and have very much improved the security of their respective systems in adopting the plan suggested herein, and that since this plan has been used troubles that heretofore were of frequent occurrence have been entirely removed.

*Paper presented at the Convention of Fire Chiefs, Charleston, S. C., Oct. 9-11, 1900.

ADDITIONAL NIAGARA POWER.

BY FRANK C. PERKINS.

Preparations are rapidly being made by the Niagara Falls Power Company to supply additional power for use at the Pan-American Exposition at Buffalo next year. The excavations and masonry for the new machinery is well under way as will be noted by the illustrations, Figs. 1 and 2, the first showing the new wheel pit from the transformer house, and the second showing the same looking towards the power house, already working to its full capacity. The interior of the power house with its full equipment is illustrated in Fig. 3. There are now in operation at the present power house ten generators of 5,000 horse power each, supplying a two-phase current at 2,200 volts and transformed, either by rotary transformers to a direct current for railway purposes in and about Niagara Falls, or raised at the transformer house to 11,000 volts and transmitted to Tonawanda and Buffalo for lighting and power purposes. A large amount of the power is used at the Falls on the lands of the Power Company for electro-chemical purposes, and this is what has consumed most of the available power and necessitated the enlargement of the plant.

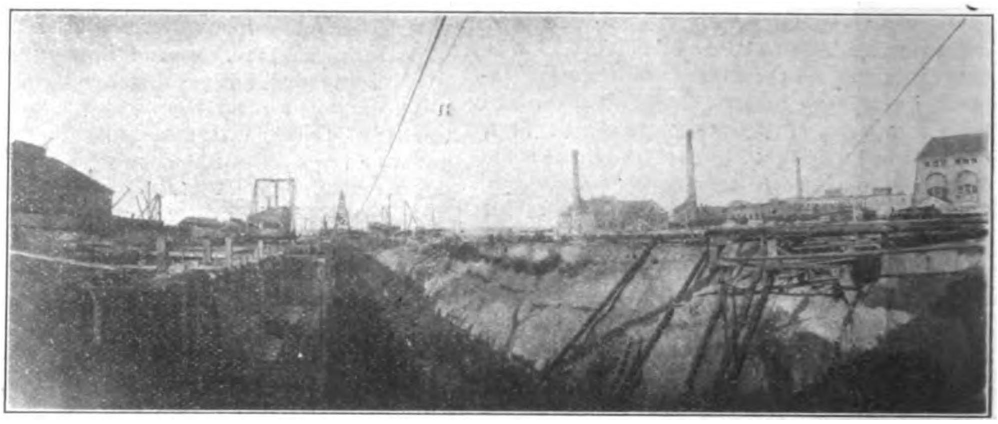

FIG 1.—NEW WHEEL PIT OF NIAGARA FALLS POWER PLANT, VIEW FROM TRANSFORMER HOUSE

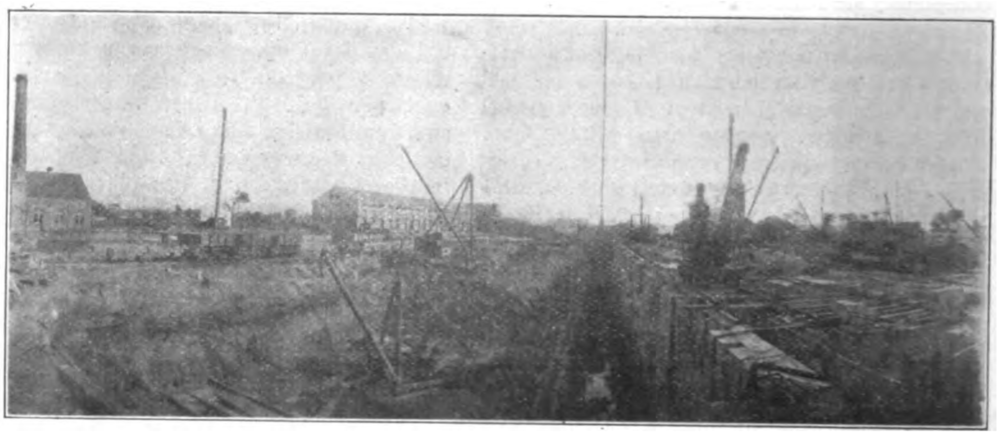

FIG 2.—NEW WHEEL PIT OF NIAGARA FALLS POWER PLANT, SHOWING POWER HOUSE AT THE LEFT.

At the Pan-American Exposition about 5,000 horse power will be needed from the Niagara plant which it is now preparing to supply.

Nineteen transformers of the General Electric air blast type will be used in the Electricity Building for reducing the pressure of the polyphase current from 11,000 volts to 2,000 volts and small step-down converters will be utilized in pits about the grounds and in the various buildings for again reducing the potential from 2,000 volts to 104 volts for use in light-

ing and power work. For the first time in the history of exposition decorative lighting incandescent lights of 4, 8 and 16 cp. will be used exclusively from an alternating current of as low a frequency as 25 cycles per second, as generated at the Niagara power house.

Several hundred men are now engaged on the new wheel pit which has nearly reached 100 feet in depth. The wheel pit is nearly 500 feet long, and in it will be installed a total of 55,000 horse power in 11 units of 5,000 horse power each. Half of the generators and turbines will be installed at once, making 30,000 horse power of available electrical energy during the coming year, and a total of about 80,000 horse power. An underground passage will connect the new wheel pit with the old one more than 100 feet from the surface.

The work on the new wheel pit is being pushed forward very rapidly both night and day, and besides the arc lights a powerful searchlight is used to aid in the illumination of the wheel pit. The various cranes, towers and cableways used in the construction work are seen in Figs. 1 and 2.

The European visit of the engineers, Brackenridge and Sellers, has resulted in some changes in the present installation to bring the new work to a more perfect state, and it is said the new turbines will be constructed according to the latest designs. It is the intention to have the new plant in operation by June, 1901.

ALUMINUM is being used for feed wires in the extensions of the Cleveland, Elyria & Western trolley system in Ohio.

FIG. 3.—5,000 HP. GENERATORS INSTALLED IN THE NIAGARA FALLS POWER COMPANY'S PLANT, NIAGARA FALLS, N. Y.

AUTOMATIC FIRE-ALARM SYSTEMS.*

BY CHARLES BURGHER,

Boston, Mass.

Before proceeding with the subject in hand I desire to thank you for your kind invitation to read before you a paper on the subject of "Automatic Fire-Alarm Systems."

When I received your invitation through your president I doubted my ability to do justice to the subject; and, allow me to say, that doubt has only become stronger.

I trust I may be able, however, to present some matter which may be of interest to you.

Description.—Briefly described, an automatic fire-alarm system consists of thermostats, or heat detectors, placed on the ceiling throughout the premises to be protected, twelve to fifteen feet apart on an open floor, and in every nook, closet and corner of the building.

These are connected by electric conductors to a signal-box placed in an accessible part of the premises, and this box in turn is connected electrically to a central station—if in a central station system—or to the nearest fire department quarters and engineer's or proprietor's house if in an isolated plant equipment.

These thermostats are usually adjusted to operate at a temperature of forty (40) degrees Fahrenheit, above the maximum temperature of the premises.

As soon as this predetermined temperature has been reached, the operation of the thermostat, either by completing or making a circuit, or by breaking one or more circuits, causes the signal-box or transmitter, by the operation of electro-magnets contained in said box, to become operative, which records at the receiving station by make or break signal wheels, certain numbers of long dashes, usually on "Morse" recording registers, designating the house or building number, and shorter dashes or records which denote the particular floor or section of the premises, each building or property having a specified box number.

In an isolated plant system this box number is transmitted directly to the nearest fire department quarters. In a central station equipment these signals have to be repeated to the nearest fire and protective department companies, in some cases by direct wires from a central station to the departments referred to; in other cities a system or form of repeating through the city fire-alarm headquarters is employed.

In some particular fire-alarm systems, however, the floor or section number is made known to the fire department when they arrive at the premises by means of an annunciator placed on the outside of the building.

In all systems this form of annunciator signals may be used in addition to, and operate simultaneously with, the fire department signals, to notify or alarm the occupants of a building, warning them that a fire or dangerous heat has been generated in a particular portion of the premises.

In connection with automatic fire-alarm equipments there are also placed in various parts of the building locked boxes with glass fronts for breakage and consequent working of the system, should fire at any time be discovered before it had generated sufficient heat to operate the system automatically.

Thermostats.—Thermostats form an important part of a fire-alarm system, and in view of the large number of thermostats now in general use, it may be of interest to trace their development in this connection.

First.—Probably the first practical thermostat constructed, certainly the first one to be put into general use, was through the application of the principle of expansion of metals.

This instrument was developed from a patent taken out in 1863 by Alexander Ross of Brooklyn, N. Y., for "Improvement in fire-alarm and heat detectors," and a modified form of the "Ross" patent served as a model in developing the first practical instrument.

The improved thermostat, patented in 1873, consisted of a compound spring of metals, in a coiled form, one end attached to insulating material and enclosed within a metal tube or cylinder. A pointed screw is placed through this cylinder directly over the free end of spring, and adjusted at any distance from same. A rise in temperature to a predetermined degree would cause the free end of spring to move by expansion and come in contact with the screw point, thereby closing an electric circuit.

This instrument is still in very general use, although experience has shown the desirability of placing the spring in a manner better suited to the conditions of the apparatus with which it is electrically connected.

Since the introduction of the above-described instrument other forms have been devised in which the same principle of expansion of metal has been employed. Among these, and the one in use to some extent, has the metals in the form of a disk, secured at its periphery, the

* Abstract of Paper read at the Fifth Annual Meeting of the International Association of Municipal Electricians, held at Pittsburg, Pa., Sept. 25-27, 1900.

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movement from expansion being obtained by the concaving of the disk.

Among other principles employed in the construction of thermostats, are those employing mercury, volatile fluids, and fusible solder. Various forms of each of these have been devised, but space will only permit me to give a brief description of the forms which have been more generally used.

Second—Those in which mercury is employed consist of a glass or metal receptacle in which the mercury is placed, in some resembling a thermometer tube, in others, a small metal cylinder. At a predetermined point above the mercury is placed metallic points of an electric circuit. An increase of temperature to this predetermined degree causes the mercury to rise and to complete the circuit.

Third—Volatile fluids are generally employed by confining these either in a small round tank, one end or one side of which is flexible, or in a small flexible metal tube in circular form, secured at one end. The application of heat to these instruments causes the fluids to be changed into gases and through these gases being confined, the flexible end of the metal tank convexes, in the first case, and in the other, the flexible tube straightens out, these movements causing electric circuits to be completed or broken.

Fourth—Of the many thermostats arranged in which fusible alloy is used, a simple form consists of a small metal ring to which is attached by fusible solder, at diametrical points, two copper tubes, with holes in tubing just large enough to admit a suitable connecting wire, allowing an electric circuit to be completed through the whole arrangement, its operation by heat depending upon the solder fusing and breaking the circuit.

Fifth.—Another more elaborate arrangement is constructed in which compression of air takes the place of electricity in, primarily, recording its operation. In this instrument a strong spiral spring of steel is held in position under pressure within an air cylinder by a peculiar and suitable fusible solder joint. To the end of spring which is held depressed is attached an asbestos washer, made to fit closely in the cylinder by the use of paraffin and wax. In case of a temperature sufficient to fuse the solder at joint, the contracted spring is released, and by suddenly forcing the washer to the other end of the cylinder, the air is compressed through a series of pipes with which the thermostats are connected, causing an alarm to be sounded.

It is of interest to note that of the various forms of thermostats now in general use, all, so far as it has been the writer's privilege to learn, employ as a basis one of four well-known principles, namely, differential expansion of metals, mercury, volatile fluids or fusible solder.

Transmitting Apparatus.—Various forms of signal boxes, or transmitters, are employed to transmit an alarm from a protected building to the fire departments or central station, upon the operation of the thermostat; but as most of those in general use at this time are of the make or break wheel pattern, they are too well known to need any special description; all of these operating by a simple train of wheels, causing circuits to be completed through a series of springs coming in contact with cogged wheels, the wheels containing a predetermined number of cogs, long cogs denoting the house or building number, and shorter cogs designating a particular floor or section of building.

It is of interest, however, to note a particular recent invention in this direction, in which the alarm is transmitted by the human voice, by means of a phonograph attachment. The operation of the thermostat in this case causes a mechanism to become active, sounding a warning alarm at the receiving station of the fire alarm company, and then, by automatically connecting a phonograph cylinder direct to the circuit, the operator at the station hears, in a loud voice, by means of a graphophone apparatus and megaphone attachment, the necessary instructions pertaining to the fire alarm. For instance, he may hear "There is a fire on the second floor of 26 Broad street," this being repeated a great number of times.

Wiring.—A feature of special value in automatic fire alarm protection is found in the system of wiring employed in improved fire alarm systems. This consists of a duplex system of wiring whereby a broken circuit, a grounded circuit or a short circuit, will not impair the efficiency of the service: this being accomplished by means of a ground connection or "Morse" circuit connected with a metallic circuit of wiring, with both a "break" wheel and a "make" wheel in the signal box.

This furnishes an extremely valuable system, for, should the circuit become grounded, an alarm may be received by means of the break wheel on the metallic circuit. Should the circuit be broken, the alarm will be given on the opposite arm of the circuit by means of the "Morse" or grounded connection; while, should the system be short circuited or crossed, the alarm will respond by this same ground connection, the two arms or sides of the circuit acting as one conductor.

I may be excused if I incidentally express, at this time, my surprise that such a system has never been generally adopted in case of municipal fire-alarm circuits, where one "break," on a metallic system which is usually employed, renders the whole circuit inoperative.

Central Station.—The central station of an automatic fire-alarm system so closely resembles a municipal fire-alarm station, or headquarters, that a special description at this time might seem unnecessary. Here are maintained, night and day, a force of operators and inspectors, ready at all times to transmit, or repeat, automatic alarms to the fire and insurance departments, and to otherwise look after the apparatus in their charge.

As I have already stated, in some cases these alarms are repeated to the departments by means of direct wires leading from the automatic alarm station to the individual companies of the departments; two or three companies, usually, being assigned to respond to these alarms.

It will be understood that these signals denote to the departments the precise location where fire, or a dangerous degree of temperature has been generated. The particular floor, or location within the premises being made known by adding to the house or property signals, shorter or quicker blows. For instance, house signal 234 followed by four quicker strokes on bell may designate to the departments that there is a fire on the fourth floor of building No. 260 Church street.

In other forms of fire department connections these automatic signals are repeated to the city fire-alarm headquarters, and from there transmitted to the department companies over the regular municipal circuits, these alarms being preceded by a special signal number which denotes that the signals to follow are for an automatic alarm, the departments having, of course, a schedule of all automatic signals, somewhat similar in form to the regular fire-alarm running card.

In isolated plant systems—so called, which service is almost entirely confined to small cities and towns, the local fire company, or perhaps a proprietor's or engineer's dwelling, or both, is substituted for or made to act as a central station.

While very efficient service may be obtained from such equipments by close observance of rigid rules issued by the insurance people relative to such installations, yet, the particular benefits derived from central station service, such as constant care and oversight by competent employes, is lacking in this form of connection.

Merit and Value.—The merit and value of automatic fire alarm protection can hardly be overestimated. I am speaking now of a system which is practical in its construction: a system in which due care has been exercised in arranging its several parts in a manner suited to the numerous conditions met with in different classes of property to be protected; a system over which the care and supervision has been placed in proper hands in the hands of one who realizes that simplicity in arrangement, durability and excellence in construction, and frequency and faithfulness in inspection are absolute essentials in an efficient system of automatic fire-alarm.

In such a system there is almost absolute certainty that any rise in temperature to a point of danger, at any hour of the day or night, will instantly be communicated to the proper parties, and the firemen advised by such signals—not only of the particular building or property, but also of the exact floor or section location—start out with perfect knowledge of the precise point to attack, and with the assurance that they have but a small fire to contend with, if it is promptly reached.

Such is the service rendered by automatic fire-alarm systems, and if this result is not attained in some forms of apparatus it is probably because all the requirements of the service expected and demanded have not been fully understood or provided for.

The merit and value of automatic fire-alarm systems might be submitted in the simple statement that "The first five minutes of a fire is worth five hours." Upon this principle is based the faith of the introducers of this form of protection. The users of this apparatus realize also that "fires must be discovered before they can be extinguished;" and this basic principle applied toward the prevention of large fire losses will continue to attract the attention of property owners and agents, insurance people and the public generally, until the installation of automatic fire-alarm systems becomes almost universal.

The generally accepted value placed on automatic fire-alarm systems is that they prevent large fire losses by the discovery of fire in its incipiency. Their value extends far beyond this, however; and I make the assertion that, could the real facts be known, it would, undoubtedly, be shown that, for every million dollars' worth of property saved from loss by fire by means of this form of protection by the early discovery of fire, one-quarter of a million dollars' worth has been saved through this form of apparatus by the discovery of dangerous heat—heat from which fire would have been generated had not the proper parties been

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called to the premises and taken the necessary means in reducing the temperature.

This is an important feature of the service, and one which should be realized and appreciated: but, with many, the situation may be likened to the case of the child who obeyed his mother and did not place his hands in the hot coffee pot—the child did uot realize what trouble had been averted by his obedience.

Automatic fire alarm systems prevent fires, and this has been demonstrated repeatedly. It is not an uncommon occurrence for the fire department to be called to a building by this apparatus and to find that probably the occupants had carelessly gone off after coaling up a furnace or stove, leaving all drafts open, with the result that extremely high and dangerous temperature had been generated. Or, possibly, they would discover where a gas jet had been left burning under a vessel for heating glue, or for various other purposes, and this may have heated the woodwork around it to a point of danger. Or, possibly, a stove or furnace funnel, which may have been placed close to the ceiling, or through wooden partitions, may have become dangerously overheated.

These conditions sometimes occur in the daytime, and the occupants know nothing of the danger until the arrival of the firemen.

The public very seldom hears of these important discoveries. Even the official reports may give, as a cause of alarm the alarm, "caused by overheat." They do not add that a fire may have been averted. And many of the newspapers often report the case as "no fire, false alarm."

This also accounts for many false alarms, so called, credited to automatic fire alarm systems.

INTERIOR WIRING.*

BY G. C. ALLINGHAM.

For several years there has been an agitation in favor of concentric wiring with an uninsulated outer conductor, and great efforts have been made to convince central station engineers of the advantages of this system of wiring. But the central station engineers apparently remain unconvinced. It has always appeared to me that the advocates of wiring with uninsulated return look at the question more from the point of view of the wireman (or perhaps I should rather say of the "wiring engineer") than from that of the central station engineer. They hardly seem to realize that the wiring of a building which is supplied from street mains is electrically a part of the distributing network of the central station. If we look at the wiring of a building by itself, and exclude from our consideration anything outside that building, the concentric system of wiring with uninsulated outer undoubtedly has advantages, but, as I shall show presently, these advantages are by no means peculiar to this system. On the other hand, if we regard the distributing system as a whole, by which I mean the whole of the network, from the central station or sub-stations, as the case may be, to the lamps, the use of the uninsulated return conductors is open to many objections.

The very property that is claimed, and justly so, as the great advantage of concentric wiring, namely, that any fault is bound to become a dead short circuit, is a serious disadvantage when we have to deal with a large distributing system, as Mr. Wordingham pointed out in his M.E.A. paper this year. In the case of a three-wire network, with earthed return conductors connected to the middle wire, a single earth on either of the outers will dead short the mains, and interrupt the supply until it can be cut out or burnt out, and it is evident that the danger of interruption of the supply will be much greater in such a case than if the system be entirely insulated from earth, or the middle wire be earthed only at the station, so that it can be temporarily disconnected from earth in case of a fault on one of the outers.

Again, on a large network, different parts even of the middle wire of a three-wire system may be at considerably different potentials, and if uninsulated returns were used, considerable currents might return through the earth and cause electrolytic troubles. Excepting at Guildford, where the system is a very small one, no wiring with uninsulated returns has yet been carried out, except in isolated installations supplied by their own dynamos, or by separate transformers, so that it is impossible to say from actual experience whether the electrolytic trouble is likely to be a serious one or not, but experience with the earth returns of electric tramways shows the kind of things that would be likely to happen. It is true that the drop of voltage on the uninsulated return of a distributing network would probably be less than that on the earthed return of a tramway; but on the other hand, the surface of the uninsulated outer would be very great, and inside a building a comparatively small amount of electrolysis (of a gas-pipe for instance) might do a great deal of damage. Again, there is a danger of the bare outer conductor itself being eaten through, and the breaking of the outer conductor might quite conceivably cause a fire.

At Guildford, although the middle wire of the street mains is bare, it is carefully embedded in bitumen throughout, and in the consumers' premises, which are wired with concentric cable with a bare outer conductor, care has been taken to keep the bare outer out of contact with any gas or water pipes: so that, although a bare outer conductor is used, a sort of attempt is made to insulate it from earth. Is not this a confession of weakness?

The principal advantage usually claimed for concentric wiring is its safety, since the outer exposed conductor is earthed, and it is therefore impossible to get a shock, and any fault must either be a short circuit, or quickly develop into a short circuit, which blows the fuse and cuts off the current until the fault is removed, so that it is impossible for any fault to endure and to cause fire or other damage. What I wish to point out, however, is that exactly the same properties are possessed by any metal-sheathed system of wiring with both conductors insulated, provided that the sheathing is made electrically continuous throughout, and is efficiently earthed, and that one of the wires is earthed at one point either continuously or at frequent intervals.

With such a system of wiring, properly carried out, any fault on either wire is bound to form a connection between it and the metal sheathing, and so earth it, either instantly or very soon, and in any event before any external damage can be done. Now if, for example, the wiring be connected to the neutral and one outer, say the positive, of a, three-wire network, the middle wire of which is earthed at the station, any fault on the positive conductor of the wiring will produce a short circuit, and blow a fuse, and so cut off the faulty conductor until it is repaired. As the negative conductor of the wiring is at or near earth potential, any fault that might occur on it is not likely to be dangerous, but such a fault could not last long if, at intervals, the outers were alternately earthed at the station, the middle wire being, of course, temporarily disconnected from earth meanwhile.

I consider that the greatest possible safety with house wiring would be attained by using double wiring, enclosed throughout in earthed metal sheathing, connected to three-wire mains having a removable earth connection on the middle wire at the station, and by earthing each of the outers (while the middle wire is temporarily disconnected from earth) for a minute or so regularly every day. Any fault in a consumer's installation on either of the outers would instantly cut itself off, and any fault on the neutral would cut itself off next time the outers were earthed at the station, so that the consumer's would be perfectly "self-testing," just as concentric wiring is, and at the same time it would be free from the objections to concentric wiring.

Even where the middle wire is not earthed, almost absolute safety would be attained by earthing each main at the station every day, for a fault on house wiring can hardly do much damage in 24 hours: the damage done by faults is nearly always very gradual, and the catastrophe does not occur until the mischief has been going on for many days or weeks.

It is evident that, to attain safety, the metal sheathing of the wiring must be electrically connected together throughout; in fact, if this is not done, the metal sheathing may constitute a danger rather than a protection, for if a fault occurs on one of the wires, which thus becomes connected to the sheathing, a portion of the latter may become charged above (or below) earth potential, and give people shocks, or, if it touches a gaspipe, it may arc to it, and in time burn a hole in it and ignite the escaping gas.

This is the great defect of the system of wiring in steel conduits with sleeve joints, which has been recently introduced, for the sleeves do not make a good electrical connection between the lengths of tube, and therefore, in my opinion, this system is not to be recommended on the score of safety; the requisite conditions may, however, be fulfilled by the use of iron or steel tubes with screwed couplings, or by lead-covered wires.

My own idea is that lead-covered wires with fibrous insulation are likely to come very much more into use for house work in the near future. They have already almost entirely superseded vulcanized rubber-insulated cables for underground mains, for which purpose they have been found to be cheaper and more durable, and what is true for underground mains is also true for interior wiring. Those who have to do with house-wiring do not generally seem to realize that a lead-coved fiber-insulated cable is much cheaper than an ordinary braided or taped rubber-insulated cable, and that this applies just as much to the smallest sizes of cables as to larger ones, while the lead-covered cable has the further advantage that it can be run without further protection in many places. The price of rubber has been rising steadily for years past, and the rise appears to be likely to continue in the future, so that the saving in cost by using fiber-insulated cables is likely to increase still further. It is now generally recognized that fiber-insulated lead-covered cables are more durable than vulcanized

*From the "Electrical Review," London.

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rubber-insulated ones for underground work, where the conditions are very much more severe than in housework, so that it is not probable that fiber-insulated cables will be found wanting in durability in interior wiring.

The objection to fiber-insulated cables is that the insulation is hygroscopic, and for this reason the ends of underground cables of this class are enclosed in boxes filled with compound in order to make a water tight seal, and it would be very difficult to effectively seal the ends of all the cables in the wiring of a building in this manner. But my own experience has been that, except in unusually damp buildings, there is no danger of the insulation being damaged by absorption of moisture. I have wired new houses with lead-covered fiber-insulated cables, and left the ends just as they were cut off, without sealing them in any way, to the tender mercies of the plasterers, who have often broken the lead covering of the projecting ends, and yet I have had no single instance of a cable absorbing damp. The only trouble I have had is with surface leakage, which is always greater with metal-sheathed systems of wiring than when no metal sheathing is used, since the sheathing itself forms a good earth close to the bare terminals on the fittings, and shortens the path of the leakage current. This surface leakage sometimes makes it impossible to attain at first in a new house the insulation resistance required by the rules of the supply authorities, but after the house has been occupied for a few weeks, and has become dry, the insulation resistance increases to the normal figure. The surface leakage is no greater with fiber-insulated than with rubber-insulated wires, whether the latter be lead-covered or run in metal tubing, and it is not by any means necessarily an indication of a defect in the wiring; in fact, as I have just pointed out, the systems of wiring which are the safest have the greatest tendency to surface leakage, and the "figure of merit" of an installation is not only not proportional to, but may even be an inverse function of, its insulation resistance. Again, I have found that, with metal-sheathed wiring, the insulation resistance often varies with the weather.

I have usually covered the ends of fiber-insulated house-wires with lappings of insulating strip, such as "Okonite" tape, or with rubber tubing, which I have found quite sufficient protection in ordinary interior wiring. The lead coverings of the wires are easily connected together by copper wires soldered to them with a blowpipe.

Some classes of fiber-insulated cables, particularly paper cables, are impregnated with oil, which gives trouble by becoming fluid in hot weather and running out of the ends of the cables and spoiling the wall-paper. Cables for indoor work should be impregnated with a more solid compound, which will not melt in the hottest summer weather, and there are many fiber-insulated cables made which give no trouble in this respect.

The use of lead-coverd cables gives a very "flexible" system of wiring. In many cases the wires can be run with safety without further protection, and they can be drawn or "fished" under floors, behind partitions and through all kinds of narrow places in a way that would be impossible otherwise; they can be cleared up on the surface, and often most inconspicuously, as they can be run in corners and along edges. Where extra mechanical protection is required, the lead-covered cables may be run in iron or steel tubing, and I have found "Simplex" and similar tubing excellent for this purpose; they can be run on the surface in ordinary wood casing where its appearance is preferred; the lead covering can be additionally protected against corrosion or abrasion where necessary by taping or braiding and compounding; for rough work the cables can be armored with steel wire or strip; and where they are especially exposed to corrosion they can be run in troughing filled with compound. In fact, wiring with fiber-insulated lead-covered cable may be carried out to suit the most varied classes of work, and so as to make a sound job under almost any conceivable conditions, and it therefore seems to me probable that this class of cable will, in the future, become the standard for interior wiring, as it may almost be said to have already become for underground mains.

SPARK-LENGTH AS MODIFIED BY SOLID DIELECTRICS.*

BY W. J. HUMPHREYS.

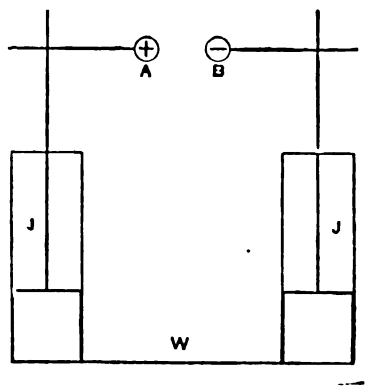
While trying some experiments with an electrical influence machine I noticed that the spark-length was greatly increased by the presence of solid dielectrics, such as glass or ebonite, at certain points near the positive pole. The phenomenon was entirely new to me, and as I was unable to find it described, or even mentioned, in either those books or journals to which one would go for such information, I decided to publish an account of my observations. After my experiments were completed my attention was kindly directed to the fact that Messrs, Queen & Co., of Philadelphia, Pa., furnished an electrical influence machine with radically different poles—one being a metallic sphere while the other is metal plate with an ebonite disk at its center. I have also learned that Prof. Anthony once used a somewhat similar machine that was imported from Berlin about 1870. It seems, therefore, that the action of solid dielectrics on the spark-length has been known for a long while, at least to certain instrument makers, and I venture to publish the following account of my own experiments along this line because I have been unable, after considerable search and numerous inquiries, to find any reference in scientific literature to this interesting phenomenon.

During the course of the experiments several machines were tried and with equal success, but the one commonly used was a two-plate Wimshurst machine, the plates being 20 ins. in diameter of ebonite and furnished with metallic sectors. The accompanying sketch shows an arrangement that gives excellent results, though, as will appear from the experiments, it may be greatly modified and the phenomenon still obtained. J, J are two small Leyden jars, W a wire joining their outer coatings, A and B discharging balls connected one to the positive the other to the negative side of an influence machine or other source of high potential, and also to the inner coating of its respective jar. Let the inner coatings of the jars be oppositely charged, as indicated, and the distance between A and B gradually increased till sparks cease to pass. If now the potential difference be maintained and a glass rod, say, be placed quite near that side of the positive pole that faces the negative, the air will in general break down and allow a full noisy spark to pass. Nothing of the kind happens when the rod is placed next the negative pole, or in fact in any part of the field other than that very near the anode.

* From the "Physical Review."

Various solid dielectrics have been used, all giving the same general result. Among them several kinds of glass, such as lead, soda and different varieties of enamel glass, some in the form of solid rods, others as tubes, even freshly drawn glass fibers of not over three-tenths of a millimeter in diameter, sticks of sulphur, rubber tubes, rods of ebonite, different varieties of wood, and finally, as an extreme case, an ordinary silk thread stretched taut and approximately at right angles to the lines of force. The increase in spark-length was usually very pronounced, often more than doubling the maximum length obtainable under ordinary conditions.

In most of my experiments the machine was kept constantly running at an approximately uniform speed, but this was simply for the purpose of holding the potential difference as nearly constant as possible, and not at all essential to the general phenomenon. The sparks of extra length could easily be obtained after the machine had come to rest, provided they were taken before the potential had fallen too low. The following are among the conditions tested: (1) Polished poles, jars belonging to machine and their outer coatings



connected, inner coatings oppositely charged. Results excellent, best obtained. (2) Polished poles, jars belonging to machine but insulated from each other, inner coatings oppositely charged. Increase in spark-length decided, but volume of spark small. (3) Polished poles of machine oppositely charged, no jars. Increase in spark-length still evident, but volume of spark of course very small. (4) Polished poles, one connected to inner the other to outer coating of a single jar. Results good. (5) Polished poles, one or more jars of large capacity. Results pronounced, but spark-length never so long or so greatly increased as with the jars belonging to the machine. (6) State of atmosphere such as to give only very short sparks. Increase in spark-length decided, but not very great. (7) State of atmosphere such as to give unusually long sparks. Increase in spark length not great, but still evident. (8) Poles separated very widely, beyond the length even of the forced spark. In this case a small spark left the positive pole when the glass or other dielectric rod was brought in proper position and disappeared along numerous little branches. (9) Negative pole polished, positive pole very rough, in fact the broken end of a metal rod. Under ordinary conditions this gave only pinkish brush discharges, except when the poles were very close together, when numerous small, white and somewhat noisy sparks passed. On placing a glass rod next the positive pole, the white and noisy sparks were more than doubled in size and length. Various other

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more or less important combinations were made, but these are sufficient to indicate the general nature of the phenomenon, the interpretation of which is probably the same, no matter what the conditions under which it is obtained.

Just what the correct or complete interpretation really is, I do not pretend to say, but the increase of the spark-length when the discharge is between two oppositely charged jars, insulated from each other, seems to preclude the assumption that it can be due to oscillations of any kind. Possibly though an explanation is found in the fact that the solid dielectrics used in these experiments have specific inductive capacities greater than that of air, and consequently produced corresponding local concentrations of the lines of force, which concentration extended to a greater or less extent to the surface of the electrode when the dielectric was in its immediate neighborhood. It may be that the increase in the spark-length was due to this local increase of the electromotive intensity, but in framing an hypothesis to explain it the fact that this increase must be next the anode has to be kept in mind. For the sake of binding these and other experiments, more or less closely together, I suggest the following hypothesis: The dielectric between two poles is most sensitive to electrical disturbances at points next the anode. The following are some of the facts that seem to support this idea. (*a*) The spark-length is increased by the presence of a glass rod say next the anode, but not affected when the rod is in any other part of the field. (*b*) The greater the increase of the spark-length the nearer the glass rod must be brought to the positive pole. (*c*) The greatest increase of spark-length is obtained with a glass rod of certain size, other things being equal. That is, the rod must not be either too large or too small for best results. (*d*) When glass fibers are used they must be brought very near the pole, usually nearly or quite in contact with it. (*e*) The same phenomenon follows when insulated conductors are used instead of glass or other dielectric. With the view of testing this idea I tried, among other things, the effects of dielectrics of widely different inductive capacities, but otherwise approximately equal. The substances used were: (*a*) A small thin-walled test-tube, empty. (*b*) Similar tube part filled with water. (*c*) Similar tube part filled with metal. The results were not conclusive, the increase in the spark-length remaining nearly the same, with, if anything, the advantage in favor of the tube part filled with water, but this was not sufficiently pronounced to warrant deductions. Again the fact that insulated metal rods act no better than glass rods does not seem to be fully in accordance with the above assumption. These, however, are the only experimental objections I am aware of, and it may be that they are by no means fatal. In further support of this hypothesis we have the increase of spark-length caused by a small spark drawn from the negative pole of two oppositely-charged Leyden jars when their outer coatings are connected, and also Faraday's experiments on spark-lengths between spherical electrodes of different sizes. In speaking of these experiments of Faraday, J. J. Thomson says: "We may express this result by saying that when the electric field is not uniform the gas does not break down so easily when the greatest electromotive intensity is at the cathode as it does when it is at the anode." It will be noticed that the hypothesis used to explain these experiments is only an adaptation of this sentence of Thomson's. Whatever the real action of solid dielectrics in increasing spark-length may be, it is a phenomenon of the anode, and to that extent indicates a greater sensitiveness of the air about this pole to electrical disturbances. It would be interesting, but probably of little use at present to speculate on the cause of this localized sensitiveness in the dielectric. Possibly it was due to the formation of Grothus' chains and the clustering of different types of ions about the two poles.

WHAT MARCONI HAS ACCOMPLISHED.

As the subject of wireless telegraphy has not yet apparently lost interest for the general reader, says Prof. J. A. Fleming in the London "Times," I venture to ask a little space to make known for the first time some recent achievements by Mr. Marconi which have astonished those who have been allowed to examine them. Every one is aware that in his system of electric wave telegraphy an important feature is the employment of an elevated conductor, which generally takes the form of a wire suspended from a mast. When Mr. Marconi attracted attention by his feat of establishing communication across the Channel without wires, critics raised a not altogether valid argument against its commercial utility, that a wave or signal sent out from one transmitter would affect equally all received within its sphere of influence, and hence the privacy of the communication would be destroyed. No one felt the force of this objection more strongly than the distinguished inventor himself, whose original work has caused so many others to attempt to follow in his steps. For the last two years he has not ceased to grapple with the problem of isolating the lines of communication, and success has now rewarded his skill and industry. Technical details must be left to be described by him later on, but meanwhile I may say that he has modified his receiving and transmitting appliances so that they will only respond to each other when properly tuned to sympathy. I am well aware that other inventors have claimed to be able to do the same thing, but I do not fear refutation in saying that no one has given practical proof of possessing a solution of this problem which for a moment can compare with that Mr. Marconi is now in a position to furnish.

These experiments have been conducted between two stations 30 miles apart, one near Poole in Dorset and the other near St. Catherine's in the Isle of Wight. At the present moment there are established at these places Mr. Marconi's latest appliances, so adjusted that each receiver at one station responds only to its corresponding transmitter at the other. During a three days' visit to Poole, Mr. Marconi invited me to apply any test I pleased to satisfy myself of the complete independence of the circuits, and the following are two out of many such tests: Two operators at St. Catherine's were instructed to send simultaneously two different wireless messages to Poole, and without delay or mistake the two were correctly recorded and printed down at the same time in Morse signals on the tapes of the two corresponding receivers at Poole.

In this first demonstration each receiver was connected to its own independent aerial wire hung from the same mast. But greater wonders followed. Mr. Marconi placed the receivers at Poole one on the top of the other, and connected them both to one and the same wire, about 40 feet in length, attached to a mast. I then asked to have two messages sent at the same moment by the operators at St. Catherine's, one in English and the other in French. Without failure each receiver at Poole rolled out its paper tape, the message in English perfect on one and that in French on the other. When it is realized that these visible dots and dashes are the results of trains of intermingled electric waves rushing with the speed of light across the intervening 30 miles, caught on one and the same short aerial wire, and disentangled and sorted out automatically by the two machines into intelligible messages in different languages, the wonder of it all cannot but strike the mind.

Your space is too valuable to be encroached upon by further details, or else I might mention some marvelous results, exhibited by Mr. Marconi during the same demonstrations, of messages received from a transmitter 30 miles away and recorded by an instrument in a closed room merely by the aid of a zinc cylinder, 4 ft. high, placed on a chair. More surprising is it to learn that, whilst these experiments have been proceeding between Poole and St. Catherine's others have been taking place for the Admiralty between Portsmouth, and Portland, these lines of communication intersecting each other; yet so perfect is the independence that nothing done on one circuit now affects the other, unless desired. A corollary of these latest improvements is that the necessity for very high masts is abolished. Mr. Marconi now has established perfect independent wireless telegraphic communication between Poole and St. Catherine's, a distance of 30 miles, by means of a pair of metal cylinders elevated 25 ft. or 30 ft. above the ground at each place.

I need not enlarge on the possibilities thus opened out for naval and military purposes. The importance of this practical solution of the problem of independent electric wave telegraphy, in which each wireless circuit is as private as one with a wire, is obvious without comment. My desire is solely to mention the above facts for the benefit of general readers, whose minds will thus perhaps be eased of any doubts lest this brilliant application of electrical discoveries should, like some others, fall short in satisfying the requirements of practical use and be relegated to the region of imperfect inventions or unfulfilled hopes.

MARKET VALUE OF A SUCCESSFUL PATENT.*

What is the market value of a successful patent? The question is a wide one; and one, moreover, upon which much ink and thought might be expended without (in all likelihood) arriving at any really satisfactory answer. The purpose, or purposes, of the patent, the area over which it is intended to be spread, its actual value for practical purposes, etc., are prominent "points" which would all require to be considered by anyone who might choose to handle this thorny theme. When he did consider the subject in all its phases he would doubtless experience great difficulty in any straightforward attempt he might make to appraise its value from a purely commercial standpoint. There is, as we all know, no set "rule" to go by in dealing with a matter of this kind, but while that is so, there can be no doubt of this, viz., that some of our present-

* From the "Engineer and Iron Trades Advertiser," Glasgow.

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day patentees have succeeded in realizing large sums (in a few instances small fortunes) from their respective inventions.

It would not be easy to mention the exact or even the approximate sums earned by the world's leading inventors during the present generation, but we are pretty safe in placing Edison in the front rank, closely followed, we might say, by Maxim, then by Kelvin, and thereafter by perhaps half a dozen others. Amongst the others hinted at might be placed Marconi, the young Italian genius, whose marvelous system of wireless telegraphy has set the mechanical world on tiptoe. Marconi, besides demonstrating the practical utility of his novel discovery—or invention—for manifold purposes, has contrived to have same placed in remunerative quarters. Thus, he is reported to have disposed of his "patent rights" in America for one million dollars and a large royalty. And now we hear that the royalty to be paid him by the British Government for his apparatus on warships is £100 per annum for each ship, and that twenty-five sets have been ordered.

Truly, the calling of the modern inventor has become a singularly lucrative one; we are, of course, speaking, of the successful inventor of the hour. We know quite well that the unsuccessful inventor (who, numerically speaking, far outweighs the former named), could tell an altogether different tale. Their "tale" has been told in hundreds of cases, as every student of biography knows the "little story" has, in not a few instances, been a sad one; one calculated to touch the sympathetic heart, and to cause the reflective reader to wonder why men of superior native ability (as inventors invariably are) should so long court a forlorn hope, for that is what a big proportion of such have done. Not only so, but these persons are often so completely taken up with their peculiar task, that is, with the perfecting of their respective device, that they not infrequently neglect the ordinary duties of life. Their daily work is performed with a grudge, and sometimes entirely neglected, while their family affairs are ignored.

A careful study of his—the unsuccessful inventor's life-story, however, brings with it its moral, a moral which all aspiring young inventive geniuses would do well to take seriously to heart. The moral is, first perform thy daily toil, next tackle thy pet hobby; for, the working out of any new idea, either in mechanics, art, or science, (or in literature for that matter), ought always to be done during one's leisure hours, thus making the self-appointed task, which may after all yield naught substantial—a hobby, rather than allowing the prosecution of same, as many have done to their sorrow and loss, to absorb the whole of one's waking hours. We are, we need scarcely state, speaking just now to those who require to earn their daily bread by the sweat of their brow. It is different with those inventors who have a private competence to "lean" upon the while. But these, we fear, be few in number.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended October 10:

Amsterdam, 1 box, $13; Antwerp, 19 cases, $3,003; Australia, 21 packages, $1,010; 6 boxes motors, $4,080; Brazil, 2 cases, $84; 23 packages, $2,500; Bordeaux, 5 cases, $491; Bremen, 4 cases, $357; British East Indies, 18 packages, $2,315; British West Indies, 13 cases, $269; British Possessions in Africa, 2 cases, $108; British Guiana, 41 packages, $1,417; other British Possessions, 77 packages, $2,650; Bristol, 74 cases, $4,700; 22 reels electric cable, $5,767; Brussels, 1 case, $28; 3 packages trolley wagons, $250; Budapest, 8 packages, $440; Central America, 55 packages, $2,494; Chili, 4 cases, $117; Cuba, 55 packages, $1,529; Dublin, 3 reels electric cable, $2,011; Dunkirk, 44 cases, $790; Florence, 3 cases, $194; Flushing, 3 boxes, $135; Glasgow, 15 packages, $15,336; 4 reels electric cable, $16,835; 7 cases $228; Hamburg, 74 packages, $10,759; Havre, 3 cases, $144; 125; packages, $2,456; 6 cases automobiles, $2,814; Leith, 6 cases, $120; Liverpool 35 packages, $6,010; 24 cases, $1,199, London, 284 packages, $41,608; 6 cases motors, $475; 93 trolley poles, $1,768; Manchester, 23 packages, $4,060; 20 packages automobile parts, $1,000; Marseilles, 27 cases, $1,853; Mexico, 33 packages $1,742; Middlesborough, 1 crate, $20; Newcastle, 12 cases motors, $1,866; Newfoundland, 1 package, $20; New Zealand, 4 packages motors, $250; Nova Scotia, 3 packages, $23; Peru, 15 cases, $464; Preston, 3 packages, $54; Riga, 7 cases, $1,155; Santo Domingo, 18 packages, $462; Southampton, 2 cases, $38; St. Petersburg, 6 cases, $369; U; S. Colombia, 3 cases, $44; Venezuela, 44 packages, $631.

PERSONAL MENTION.

Mr. Fred Leonard Bloss, who was recognized as one of the leading electricians of the West, recently died at his father's home in Kansas City, Mo.

Mr. H. R. Bostwick, the San Franciscan who recently completed an electric railway at Seoul for the Emperor of Corea, returned a short time ago to San Francisco.

Mr. W. H. Conrad, formerly with the Philadelphia & West Chester Traction Company, was recently appointed superintendent of the electrical department of the Newton Electric Street Railway Company.

Mr. William H. Wilson, superintendent of the Camden, Gloucester & Woodbury trolley road, which is now operated by the South Jersey Electric, Heat, Power & Traction Company, has been transferred to the superintendency of the electric light works in Gloucester, N. J., which is also under the control of the above corporation.

Mr. Lewis A. Goudy of Portland, Me., has been elected president of the New England Automatic Telephone Company, of which he was already general manager.

Mr. Charles H. Duell, the Commissioner of Patents, will soon resign to engage in law practice in Syracuse, N. Y.

Mr. George Treadway Thompson, president of the Denver (Col.) Gas & Electric Cmopany, died recently, aged 31 years.

COMING ELECTRICAL EVENTS.

American Street Railway Association—Will meet in Kansas City, Mo., Oct. 16-19, 1900.

Roentgen Society of the United States—Will meet in New York City Dec. 13-14, 1900.

INCORPORATIONS.

The Bishop Electric Company, New York City. Capital stock, $50,000.

The Dayton & Mayesville Electric Railway Company, Morrow, O. Capital stock, $10,000.

The Hamilton Electric Supply & Construction Company, Limited, Hamilton, Ont. Capital stock, $40,000.

The Auto Electric Shunt Company, West New Brighton N.Y. Capital stock, $5,000. Directors: E. R. Cliff and A. B. Proal, Jr., West New Brighton; F. W. Wise, Port Richmond.

The Modern Engineering Company, Wellsville, O.—to do a general mechanical and electrical engineering business. Capital stock, $150,000. Incorporators: C. R. Dallas, H. L. Ken, G. B. Thurber, C. E. Reed, all of Pittsburg, Pa., and T. Charlton of Chicago, Ill.

The Montgomery Power Company, Amsterdam, N. Y.—to furnish electricity for producing, light, heat and power and for lighting the streets of Amsterdam, Johnstown, Gloversville and other places. Capital stock, $100,000. Directors: William K. Archbold, Paul T. Brady, Robert E. Drake, Syracuse; W. Barlow Dunlap, William B. Charles, Robert R. Reed, Amsterdam, and Jacob Snell, Fonda.

The Broadalbin Electric Company, Broadalbin, N. Y.—to furnish light, heat and power for the village of Broadalbin Capital stock, $25,000. Directors: Henry B. Dakman, E. H. Tucker and T. Arthur Farley, Brooklyn; L. U. Shafter, Rockville Center, and Charles F. Lehman, Smithtown, L. I.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED OCTOBER 9, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

659,335. Base for Trolley-Poles. Andrew C. Wolfe, Freeport, Pa., assignor of one-third to Joseph F. Hewitt, Allegheny, Pa. Filed Dec. 26, 1899.

659,355. Trolley Finder and Guard. Harry C. Williams, Pasadena, Cal. Filed April 26, 1900.

659,550. Electric Railway. James D. Robertson, La Salle. Ill. Filed Jan. 31, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

659,268. Glower Heating Apparatus for Electric Lamps. John Van Vleck and William N. Stevens, New York City. Filed April 27, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

659,244. Circuit-Controller. Adam Lungen, New York City. Filed Feb. 23, 1900.

659,357. Apparatus for Locating Faults in Electric Circuits. William E. Athearn, New York City. Filed Jan. 23, 1899.

659,389. Electric Meter. Thomas A. Edison, Llewellyn Park, N. J. Filed Sept. 24, 1898.

659,417. Self-Adjusting Circuit-Breaker for Electrical Welding Machines. John C. Perry, Clinton, Mass. Filed March 26, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

659,269. Annunicator for Telephone-Exchanges. Benjamin Waller, Detroit, Mich. Filed Dec. 20, 1897.

659,588. Telephone-Switchboard Annunciator and Jack. Charles T. Mason, Sumter, S. C. Filed Nov. 28, 1899.

MISCELLANEOUS.

659,409. Electric Bipolar Dilator. Charles L. Mosher, Chatham, N. Y. Filed Aug. 25, 1900.

659,443. Commutator and Method of Making Same. Edwin R. Gill, New York City, assignor to the Invention Developing Company, of New Jersey. Filed March 1, 1900.

659,467. Electrical Illuminated Button. Walter A. Church Pittsburg, Pa. Filed Dec. 9, 1899.

659,479. Electric Program-Clock. Harry F. Jordan, Chicago, Ill., assignor of one half to Albert L. Bently, same place. Filed Dec. 15, 1899.

659,493. Safety Device for Elevators. George E. Shepler, Pittsburg, Pa. Filed June 3, 1899.

659,499. Signal System. Isaac W. Ullman, New York City. Filed Nov. 17, 1899.

659,506. Magnetic Regulator for Galvanometers. James J. Bradley, Newark, and Louis M. Pignolet, Orange, N. J.; said Bradley assignor to said Pignolet. Filed April 13, 1899.

659,533. Electrically Controlled Coin Feeding Appliance for Vending-Machines. Richard Kann, Jena, Germany. Filed March 8, 1900.

659,539. Supporting Device for Electric Motors. Charles A. Lindstrom, Chicago, Ill., assignor, by direct and mesne assignments, to the Hewitt Lindstrom Motor Company, same place. Filed Oct. 16, 1899.

659,544. Telegraph System. Frank D. Pearne, Davenport, Iowa. Filed April 16, 1900.

659,559. Lightning-Arrester. Charles M. Taylor, Georgetown, Ky. Filed June 12, 1900.

659,605. Electric Thermostat. Leonard H. Des Isles, Cambridge, Mass. Filed Jan. 10, 1900.

659,631. Device for Removing and Replacing Incandescent Lamps. Roch Croteau and Richard J. Messier, Denver, Col. Filed June 11, 1900.

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THE TELEPHONE WORLD.

Telephone Improvements.

W. H. Baker, the general manager of the Diamond State Telephone Company, has lately been in Easton, Md., where the company has a force of fifty men at work rebuilding the telephone exchange and equipping it for 200 telephones and substituting a modern and best-approved apparatus for that hitherto used. Copper wire is substituted for iron wire on the main routes. Easton will have direct connection without break by copper wire with Denton, Centreville and Chestertown. A copper wire will run direct from Easton to Georgetown, Del., connecting with copper wire circuits through Delaware to Wilmington and Philadelphia. Another circuit goes direct from Easton to Cambridge, Md., where the exchange and service are being rebuilt as in Easton. In making the improvements and betterments the company will spend from $15,000 to $20,000.

The cable across the bay will run from a point on the Chester River side of Kent Island, above Love Point, to Sandy Point, on the western shore.

Asked how the cable could be protected from being broken by oyster dredging, Mr. Baker said that the bottom selected for the cable is a strip where there are no oysters for three-quarters of a mile on each side of the cable's path and where, in the shallow water, there are rocks the dredgers avoid. The Secretary of War has given permission to the telephone company to buoy the cable's site. A direct telephone service from Washington to the Delaware breakwater is appreciated by the War Department. As to oyster dredgers, one thing they always avoid is getting their machines fouled by any stationary submarine object. They will evade raking their dredges across a cable if they know where it is.

One object of the telephone company in the work it is doing now is to connect together every town, village, and hamlet on the Peninsula. Another is to get as good long-distance telephone service for the Peninsula as any section of the United States has.

The board of fire commissioners of San Francisco, Cal., has hit upon a novel plan whereby a considerable sum of the appropriation allowed it for the maintenance of the fire department for the fiscal year 1900-1901 may be saved. The board of supervisors recently decided that the telephones in use in the several departments must either be paid for out of the regular appropriation or removed, and the fire department came under this order. The battalion chiefs had 'phones in their residences, and the board recognizes the need of the same, but could not see its way clear to pay for them. It is now proposed to let the telephone company take the telephones out and have a "local" system introduced by the department of electricity. Those in authority say there is no apparent need why an engine house should be connected with the entire city at great cost to the municipality. The plan has not been fully decided upon as yet, but is very favorably considered.

Work on the new line of the Home Telephone Company in North Tonawanda, N. Y., is progressing rapidly, and President A. R. Smith recently said that the system will be in full operation with at least 300 subscribers by December 1. With the exception of putting in the instruments, all of the work in the village of Tonawanda is now finished. No telephones will be installed in Tonawanda until the line is ready for operation in North Tonawanda, and then all of the instruments will be put in at once. The equipments for the exchange have arrived and are being put into the central office. Work has been started on a toll line between North Tonawanda and Niagara Falls, the line being begun at both ends. President Smith also says that the Lockport Home Telephone Company expects to finish the line in that city by February 1, and then a toll line between Lockport and North Tonawanda, and between Lockport and Niagara Falls will be built.

W. H. Blake and others, who conduct an independent telephone exchange at Cheboygan, Mich., have appealed to the common council at Sault Ste Marie in the same State for a franchise to operate a telephone exchange in that city. There have been many complaints against the service rendered since the consolidation of the two companies which formerly existed there, and this new movement is the outcome.

Several stockholders of the Mutual Telephone Company of Des Moines, Ia., have subscribed to the preferred stock as planned at the last meeting of the directors. No systematic canvass has been made to secure signatures, but it is thought men will be obtained for this work and then the preferred stock will be found of ready disposal.

The Michigan Telephone Company has reduced the rate for talks between Detroit and Pontiac to ten cents for a five minute use of the wire.

The New England Telephone Company will place its wires underground on the main streets of Laconia, N. H.

'Phone Service for Mines.

It is learned that the newly incorporated Mountain Telegraph Company is a project controlled by the officials of the Colorado Fuel & Iron Company. It is capitalized at $1,000,000, and it is the intention of the company to construct a telegraph and telephone service of its own.

The lines will connect all the works of the company located in Colorado, New Mexico and Wyoming. In this way the mines as well as the plants will be brought into close connection with the central management.

For several months P. L. Spooner, of Madison, Wis., has been at work perfecting a township telephone company, with a field of operations intended to cover the State of Wisconsin. He now announces the organization of the Farmers' Telephone Construction Company, with a capital of $500,000. The novel plan of giving every farmer a perfect telephone service at low rates has been the subject of careful study on the part of the organizers for the past three years. They have at last hit upon a practicable plan that will give every country-dweller the benefits of complete telephone service at small cost. The company will begin operations at once, and expects to put in a number of township systems in Southern Wisconsin within the next few months. Later it will extend its operations to other States.

Twenty-six poles set by the Independent United States Long Distance Telephone Company of Newark, O., and three belonging to the Granville local exchange were cut down a short time ago, and wires were cut as a climax to the bitterest warfare ever waged against an Ohio corporation. The people declared that poles were set too short and protested in vain against the destruction of shade trees by the trimmers. Trouble in erecting the poles recently was prevented, but when trimming began and people saw their handsomest trees doomed they rose up as one man. Mayor Lewis headed them and swore in many deputy marshals, and ten telephone men were arrested.

The Cumberland Telephone Company of Shelbyville, Tenn., having advanced rates to $2 50 per month, the business men of that town have ordered their 'phones taken out, and this has been done. Lately an independent telephone company was formed there, and it is said will soon be ready for business at much lower rates than those demanded by the Cumberland Company. This independent company has ample capital, it is claimed, and has already secured the rights of way along the streets.

The Belmont Telephone Company seems to be successful in the way of securing franchises in Belmont County, O., as it has not yet been refused in any part of the county, although the Bell Company has been fighting it. It is said the latter company was recently turned down at St. Clairsville and also at Flushing, O., which has a local company of its own which will probably be connected with the Belmont Company. It will give the Flushing Company connection with the whole county and Wheeling, W. Va., which will be a great convenience. The new company has received much encouragement in Wheeling, almost all business houses having signed a contract.

The Union Traction Company of Marion, Ind., is preparing to run its cars by a train dispatcher, who will use the telephone. A telephone will be located at each of the sub-electric plants, and the cars will be followed in their movements as are those of a steam railroad. The company has found that the signal system it is using is not productive of good speed. The construction of the telephone lines will begin shortly.

The Exchange Telephone Company which is building a line to connect the independent line in Moundsville, W. Va., with its system in the lower end of Marshall County, has the work about completed.

The Hudson River Telephone Company is about to make many improvements in its plant at Hoosick Falls, N. Y. It will rebuild the exchange and make an entire metallic circuit, and a new modern switchboard will be placed in its office.

Trinity, Tex., will soon be equipped with one of the best telephone systems in the State. The Southern Telephone Company is putting the system in. It has arranged with the Southwestern for long-distance connections.

Auburn, Me., has had a number of new telephones put in recently.

A telephone system is being put in throughout the City of Edgar, Neb. The company consists of Edgar business men and the system is the Central Telephone System of St. Louis.

The Georgia Telephone and Telegraph Company of Savannah has just issued a new list of subscribers which shows that the number has increased 115 per cent since the first book was issued last May. It is a record of which the company is justly proud. Since the company commenced business it has been forced to make one addition to its switchboard, and the outlook is that another and even larger addition will have to be made within the near future. Despite the number of 'phones that have already been put in the company has still contracts for 150 or more instruments and the orders that come in daily keep the list up to this mark, though between eight and ten 'phones are put in each day. Some of the underground cables have already been completely used up and others will have to be provided to accommodate the new 'phones. This additional cable has been ordered and will be drawn in as soon as it arrives. The company is also building a line between Savannah and Meldrim in order to get a direct connection with Statesboro and other towns along the Savannah and Statesboro road. This connection is now being made via the line of the Seaboard Air Line, but has grown too large to be handled in connection with the other business of that line, hence the new connection.

The Chester County Telephone Company's line, between West Chester and Kennett Square, Pa., was opened for business a short time ago and the service afforded is of the best. Work is being pushed on the extension of the line to Oxford and other places. At the present time 18 'phones are working in Kennett Square and a number of others will soon be placed in service. There will be a large number in Oxford, West Grove and Avondale when the line is open for service.

Under the management of Superintendent Frank J. Kelley the Albemarle Telephone Company lately opened its long-distance line to Richmond, Va., and now Charlottesville and the capital city are on speaking terms. The Albemarle Company has also opened connection with the Louisa Telephone Company, and the people now talk with Gordonsville, Somerset and many points in Fluvanna County. The above connections will give the Albemarle Telephone Company upwards of 2,000 additional connections.

There is evidence to show that the Massachusetts Telephone Company, which started in to do business a year or so ago, and which then apparently retired from the field, has taken on a new lease of life, since it has been heard from again in Brockton, Mass.

The Susquehanna Telephone and Telegraph Company held a meeting last week and appointed a committee to purchase of N. S. Williams the telephone line from Windsor and vicinity to Susquehanna, Pa.

T. D. Crow, a stockholder and general manager of the Butler Telephone Company at Mountain City, Tenn., has sold his interest to A. H. McQueen.

The Michigan Telephone Company has let contracts for the erection of two brick exchange houses at Grand Rapids to cost $13,000.

The Erie Telephone system made a net gain of 3,022 subscribers in September. The total number connected September 30 was 134,570. The number waiting connection, 3,672.

The People's Telephone Company, of Chatfield, Minn., lately amended its articles increasing the capital stock from $50,000 to $75,000.

J. T. White, of Louisiana, is preparing to construct a telephone line to Murfreesboro in Pike County, Ark., and all intermediate points.

The Flushing, O., Telephone Company, has increased its capital stock from $3,000 to $10,000.

TELEPHONE INCORPORATIONS.

The Carnot Telephone Company, Carnot, Pa. Capital stock, $1,000.

The Oil Belt Telephone Company, Fostoria, O. Capital stock, $10,000.

The Starline Telephone Company, Russelville, Ind. Capital stock, $192. Directors: C. H. Ramsey, Leonard Wilson, W. C. Boyd, J. W. Whitled and C. F. Fordice.

The Delmar & Hoytville Telephone Company, Harrisburg, Pa.—to maintain telephone lines in Lycoming, Tioga and Potter Counties. Capital stock, $2,000,

The Greenfield Telephone Company, Greenfield, N. Y. Capital stock, $1,000. Directors: C. E. Latham and Henry Menshausen, Porter's Corners, and J. S. Robinson, Greenfield Centre.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Barberton, O.—The question of Barberton owning its own electric light plant will be submitted to a vote of the people at the November election.

Benson Mines, N. Y.—Albert E. Clark will equip Post & Henderson's mills at this place with an electric lighting system.

Beresford, S. D.—John Croskey has decided to put in an electric light system and expects to have it in operation by December 1.

Big Rapids, Mich.—This city is about to advertise for bids for lighting the city.

Blaine, Wash.—This place will soon have an electric light plant. L. W. Davis is interested.

Boonsboro, Md.—The burgess and commissioners recently entered into a contract with L. A. Funk to light the town by electricity for five years for $310 a year.

Cienfuegos, Cuba.—Bids are asked until October 26 by the municipal council for electric lighting.

Clayton, Ala.—This city is considering the question of erecting an electric light plant.

Columbia, La.—The people of this town are considering the question of putting in an electric light plant..

Cumberland, Md.—The Edison Electric Illuminating Company of this city has voted to issue $35,000 of bonds to build the steam pipe system now being laid in the streets and to make improvements to the electric light plant.

Detroit, Mich.—The public lighting commission is preparing to install a new triple expansion engine to increase the capacity of the plant.

Franklin, Ind.—The Franklin Water, Light & Power Company will soon let contracts for an electric light plant to cost $30,000.

Greenville, N. C.—The citizens of this place are agitating the question of erecting an electric lighting system.

Highland, Ill.—At the city council meeting held here recently it was decided to erect an electric light plant.

Ironwood, Mich.—The machine shops and electric light plant of the Oliver Mining Company of this city, recently burned. Loss $25,000, covered by insurance.

Ithaca, N. Y.—The citizens are agitating the question of erecting a second electric light plant and the establishment of a heating and power supply plant in this city.

Kutztown, Pa.—The Keystone Electric Light & Power Company has been organized here with D. P. Grim president.

Luzerne, Pa.—The West Side Electric Company is changing the old Heissler system of lighting for a system called the Stunter alternating system. The lights are better in every way.

Matanzas, Cuba.—The city council is now advertising for a proposition for an electric lighting and electric railway franchise.

New Haven, Conn.—The Consolidated road will soon establish an electric light station in this city, from which will be furnished all the power to be used for illuminating its own property.

New Iberia, La.—This city has voted to build an electric light plant.

Oelwein, Ia.—The Oelwein Light, Heat & Power Company has purchased the plant of the Oelwein Electric Light & Power Company. The new company intends to greatly improve the plant in the way of adding to the machinery and equipment.

Pembroke, Ky.—W. S. Bumbus will erect an electric light plant here.

Philadelphia. Pa.—The Ambler Electric Light Company has increased its rates because the borough has levied a tax of $1 on each pole in the borough.

Pittsfield, Mass.—The Eureka Electric Company will wire St. Charles' Church for electric lights.

Port Washington, N. Y.—Robert La Porte an electrician of Tremont, N. Y., was here a short time ago and said if he can secure the franchise from the old company he will build a plant and not only light this village, but he will extend the line to Manhasset and Sands Point.

Renton, Wash.—This place, Auburn and Issaquah are soon to be lighted from the Snoqualmie plant, the main transmission line, which passes through the towns in question, being tapped for the purpose.

San Diego, Cal.—A duplicate lighting plant is being installed by the San Diego Gas & Electric Light Company, involving an expenditure of $25,000.

Steamboat Springs, Col.—This newly incorporated town has granted to G. H. Smedley a twenty-year electric light franchise. Work on the construction of the plant will be commenced at once.

Westville, N. J.—Another movement has been started here to get electric lights.

STREET RAILWAYS.

Akron, O.—Capitalists of this city and Cleveland have combined their means in the formation of a company for the purpose of building an electric railway from Lima south to Wapakoneta, a distance of 29 miles, and the company will soon be incorporated under the name of the Western Ohio Electric Railway Company. W. Christy of this city is one of the projectors. The concern will be capitalized at $500,000.

Albany, N. Y.—The Albany County Railroad Company, a street surface railroad to be operated by electricity, with a capital stock of $20,000, was incorporated on October 10, with the Secretary of State. The length will be about three-quarters of a mile.

Asheville, N. C.—A trolley line from this place to Sulphur Springs is to be built by R. P. Hayes and others.

Bel Air, Md.—At a recent meeting of the town council the Bel Air & Havre de Grace Electric Railway Company was granted the franchise of running cars through the streets of this place.

Boston, Mass.—The syndicate headed by J. F. Shaw & Co. of this city has secured the right of way from Trenton to Philadelphia for its new trolley system.

Brookfield, Mo.—The proposition of building an electric road between this town and Keytesville is being revived by the local commercial club and the citizens of Keytesville. O. B. Anderson, of Keytesville, is the chief promoter.

Chillicothe, O.—An electric road is to be built from this city to Hillsboro via Bainbridge. Eastern men are to furnish the money, and the Chillicothe Company builds the road. Work will begin January 1.

Colt's Neck, N. J.—John F. Beckman owns two farms between here and Scobeyville. He says that if the proposed trolley line from Freehold to the shore comes through this place and Scobeyville he will give a right of way through his lands and also contribute cash toward the enterprise.

Concord, N. H.—At the annual meeting last week of the stockholders of the Concord & Montreal Railroad it was unanimously voted to authorize the building of a branch from this city to Hudson, to be operated by electricity, and to issue bonds for the construction thereof to an amount not to exceed $1,000,000.

East Glastonbury, Conn.—The officials of the Hartford Street Railway Company visited this place a short time ago to consider the feasibility of extending the trolley line from Glastonbury to this village.

Holly, Mich.—The council and town board lately granted an electric road franchise to the Egyptian Portland Cement Company to connect its two factories to be built a mile east of this place and two miles west of Fenton. The road will be nine miles long.

Indianapolis, Ind.—The Street Car Company of this city will expend $500,000 in revolutionizing its power and feed system. By establishing a storage battery enough electricity can be stored to furnish power for the whole system for some hours should the machinery at the power house become impaired.

Larchmont, N. Y.—The work of changing the horse railroad to an electric line is in progress in the Manor part of this place.

Plainfield, N. J.—The Riker-Hine syndicate has combined all its trolley interests in the vicinity of this city under the corporate title of the Elizabeth, Plainfield & Central Jersey Railroad.

Redkey, Ind.—The city council granted F. G. Brownell a franchise to run his new interurban electric line through the streets. Work will soon begin on its construction.

Sharon, Pa.—Townsend, Reed & Co., of Chicago, which has absorbed the Valley street railway franchises of the Sharon & Wheatland Electric Line and rights in the Youngstown-Sharon proposed electric road, expects to expend $450,000 for construction of a new interurban system between here, Sharpsville, Wheatland and Youngstown.

Way Cross, Ga.—At a special election held a short time ago in this city a 50 year franchise was granted to the Way Cross & Suburban Railway Company for constructing and operating an electric street railway.

Wilmington, Del.—W. H. Quigg, of Philadelphia, Pa., was awarded the contract to build a new trolley line in this city.

MANUFACTURING.

Decatur, Ill.—The plant of the Feries Manufacturing Company, makers of electric lamp holders, was recently destroyed by fire. Loss $40,000, partly covered by insurance. The plant will be rebuilt at once.

Far Rockaway, N. Y.—A new factory has been erected by the Rockaway Motor Company, a concern formed for the purpose of building electric motors and launches. The company has an order for twenty electric launches, which are to be delivered to a Connecticut firm before spring.

Knoxville, Tenn.—Rodgers & Co., manufacturers of specialties, lately installed an electric plating plant, which can be used to plate all kinds of metals.

Warren, O.—The Economy Electric Company of this city was lately organized by P. L. Webb, George H. Jones, George B. Sawyer, J. W. Powers and H. W. Smith, Jr. It will make dynamos, insulators, motors and electric supplies of all kinds on a capital stock of $50,000.

COMPANY MATTERS.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company announces that contracts for the erection of a new $800,000 four-story central car barn and general office building will be let within a short time.

New Haven, Conn.—The Dennison Electrical Company of this city has filed a petition in bankruptcy in the United States Court. The liabilities are given as $24,618.66, and the assets $2,961.13.

New York City.—At a meeting of the board of directors of the Sprague Electric Company, held recently, the following officers were elected for the ensuing year: John Markle, president; Edward C. Platt, first vice-president; Allan C. Bakewell, second vice-president; Charles P. Geddes, secretary; H. R. Swartz, treasurer and assistant secretary.

Syracuse, N. Y.—Jesse L. Hinds of the Crouse-Hinds Electric Company said lately that the firm is working all the men it has room for. Large orders are being filled for domestic and foreign trade. Encouraging reports come from the branch houses in the East and the outlook is good for a busy fall and winter for the manufacturers of electrical goods.

Walla Walla, Wash.—This place proposes to grant a franchise to an electrical company on condition of underground wires and a percentage of receipts to the city treasury.

POWER AND TRANSMISSION PLANTS.

Fairfield, Me.—Contractors have in hand plans for the erection of a new pulp mill in this village for the Somerset & Kennebec Company. The mill will be for the manufacture of pulp and electricity, the latter for use by the company in operating its railroad.

Vancouver, B. C.—A syndicate, headed by ex-Governor Mackintosh, has obtained control of the Slave Lake Power Company. The project contemplates the use of the water power of the falls on Slave River for the development of electricity for manufacturing purposes in this and other coast cities.

Weldon, N. C.—The Roanoke Navigation & Water Power Company will erect an electric transmission plant for power and lighting service.

AUTOMOBILES.

Cleveland, O.—A. W. Oppman, representing the company that wants to run a line of automobiles in the parks, says a five-year franchise will be accepted.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.- Oct 15.						
United Traction	100	$5,000,000	$5 000 000	1½ % Q.,	117	119
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.- Oct 15.						
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn- Oct 15:						
Bridgeport Traction Co............	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md - Oct 15						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¼
Boston, Mass.- Oct 15						
New England Street Ry............	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S.. Jan.	112	114
Boston Elevated R. R..............	100	10,000,000		2¼ % Aug. 99,	145½	146
Brooklyn N. Y.- Oct 15:						
Brooklyn City Ry.............. ...	100	2,000,000	1,928,400	....	228	229
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	51¾	51⅞
cBrooklyn Heights Railroad......	....	200,000	200,000	....	107	109
*dBrooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
eBrooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.......	100	2,000,000	1,884,200	2¼ % Nov., 99	325	332
Kings County Elevated............	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co.........	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
fAtlantic Avenue Railroad........	50	2,000,000	2,000,000	....	..	..
gBrooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.- Oct 15:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co...............	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.- Oct 15						
Columbus Street Railroad..........	100	8,000,000	8,000,000	1 % Q., Feb.	27	29
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	83	85
Charleston, S. C.- Oct 15						
Charleston City Ry. Co.............	50	100,000	100,000	8 % S.	..	..
Enterprise City RR. Co............	25	1,000,000	250,000	....	..	..
Chicago, Ill.- Oct 5						
Chicago City Ry. Co................	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	212	214
Chicago & South Side R. T. RR....	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR...........	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	3	10½
Met. West Side El., pfd.............	100	15,000,000	9,000,000	....	81	81¾
North Chicago Street RR...........	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
hNorth Chicago City RR...........	100	500,000	249,900	....	190	200
South Chicago City Railway........	100	2,000,000	1,608,200	....	99	101
West Chicago St. RR. Co............	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99¼
Union Traction Ry.. .. ..com	....	1,250,000	624,900	85 %	10⅝	11
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	46¾	47
Cincinnati, Ohio.- Oct 15:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
iCincinnati Street Ry. Co...........	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.- Oct 15						
Akron, Bed. & Clev. Elec. Ry.......	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry...................	100	8,000,000	7,600,000	3-5 % Jan.	100	101
Cleveland Electric Ry..............	100	12,000,000	12,000,000	¼ % Q., Oct., '99.	87	88
Detroit, Mich.- Oct 15						
Detroit Citizens' Street Ry.........	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry..........	100	....	1,200,000	....	175	..
Rapid Railway Co..................	....	250,000	250,000	....	90	100
Detroit Electric Railway............	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry....	100	250,000	200,000	....	100	110
Dayton O.- Oct 15						
City Railway Co............ .com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co................pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway......... ..		1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Oct 15						
Hartford Street Ry. Co..............	100	$4,000,000	$200,000	8 % S., Oct.,	150	-
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	-
Holyoke Mass.—Oct15						
Holyoke Street Ry. Co..............	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Oct 15						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind—Oct 15.						
**Indianapolis Street Ry............	....	5,000,000	5,000,000	....	18	21
Lancaster, Pa.—Oct 15						
Pennsylvania Traction Co..........	100	10,000,000	9,900,000	....	--	-
Lancaster & Col. Electric Ry......	....	....	87,500	....	--	-
West End Street Railway.........	....	....	....	....	--	-
Louisville, Ky.—Oct 15						
Louisville Ry....................com.	100	4,000,000	8,500,000	1¼ %., April.	78	79
Louisville Ry..................... pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1.	109	110
Minneapolis, Minn.—Oct 15						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68¾
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.—Oct 15						
Montreal Street Ry. Co.............	50	4,000,000	4,000,000	8 % S., M. & N.	267	297¼
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¾ % S., J. & J.	† 100¾	109¼
Memphis Tenn.—Oct 15:						
Memphis Street Railway Co..........	100	500,000	500,000	....	25	-
New Haven, Conn.—Oct 15:						
Fair Haven & Westville RR.........	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville..........	100	700,000	800,000	....	..	--
Winchester Avenue RR............	25	1,000,000	600,000	....	45	46
New Orleans, La.—Oct 15						
Canal & Claiborne RR. Co..........	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
aCrescent City RR.............guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
bNew Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad...................	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway..........	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Oct 15:						
Central Crosstown RR...............	100	600,000	600,000	2½ % Q.	255	300
cChristopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q.,Nov.	120	185
dMetropolitan Street Ry. Co........	100	45,000,000	45,000,000	2½ % Q.,Feb.,1900.	154⅞	155
eBleecker St. & Fulton Fy.Ry.guar	100	900,000	900,000	¾ % A., July,	82	86
fBroadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
gCen.Park,N.&E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q	192	200
hEighth Avenue RR................	100	1,000,000	1,000,000	....	390	405
i42d St. & Grand St. Ferry RR.guar	100	750,000	748,000	4½ % Q.	392	402
jNinth Avenue RR......... ..guar.	100	800,000	800,000	....	195	205
kSixth Avenue RR............guar	100	2,000,000	2,000,000	....	205	225
lTwenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR..................	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR....................	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109¼
m42d St.,Manhatv'le & St.Nich.Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Oct 15.						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60¾
North Jersey Railway Co........	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	n1¾ % A.	16	19
Pittsburg, Pa.—Oct 15:						
Allegheny Traction Co..............	50	500,000	500,000	....	57	58
oConsolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	28⅝
Consolidated Traction Co......pfd.	50	9,173,850	9,000,000	3 %, Nov.	60	61
pCentral Traction Co.............	50	1,500,000	ǀ900,000	1½ % Nov.	69	70
qCitizens' Traction Co............	50	8,000,000	‡3,000,000	6 % A.	72¼	72½
rDuquesne Traction Co............	50	8,000,000	‡3,000,000	6 % A.	..	...
sPittsburg Traction Co............	50	2,500,000	1,900,000	3½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	ǀ2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry...........	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..................com	50	17,000,000	17,000 000	J. & J.	14	14½
United Traction Co..................pref	50	8,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ǀ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

Name.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Oct 15						
Union Street Railway Co..........	100	$350,000	$350,000	3 %, Feb.	160	165
N orthampton, Mass—Oct 15						
Northampton Street Ry............	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Oct 15						
Omaha Street Ry..................	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Oct 15:						
Paterson Ry. Co..................	100	1,250,000	1,250,000	....	54	--
Prov ce, R. I.—Oct 15:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Oct 15						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount....	50	1,966,100	‡1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	583,900	‡583,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co............ $12½ pd	50	30,000 000	29,980,450	....	96⅞	97
*b*Electric Traction Co.............	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry........	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co.........	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry....	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co............	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
*g*Germantown Passenger Ry....	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co........	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	95¼	95½
*j*Catherine & Bainbridge St.....	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar..	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co......	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry.....	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR..	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry....	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar...	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co.......	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry ...	50	750,000	‖750,000	$10 share, July '98	262	263
Rcclester, N. Y.—Oct 15						
Rochester Railway Co.............	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Oct 15						
*j*Reading Traction Co.............	..	1,000,000	1,000,000	Semi-an.,Jan. & Jy	24	26
*k*City Passenger Ry...............	50	850,000	850,000	Jan., '98.	133	...
*l*East Reading Electric Ry.........	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Oct 5						
Fourth Street & Arsenal Ry......	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co..........	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.........................	100	2,500,000	2,400,000	1¼ % Jan.,'99.	--	--
National Railway Co...............	--	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds....	--	2,500,000	2,500,000	....	--	--
Citizens' RR......................	100	2,000,000	1,500,000	4 %, Oct., '93.	--	--
St. Louis RR......................	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.......................	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co..................	50	1,000,000	300,000	50c., Dec., '89.	--	--
United Electric Ry............com.	50	500,000	500,000	....	20	21
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry..........	100	2,500,000	2,500,000	....	68	70
Union Depot RR...................	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Aug.						
California St. Cable RR...........	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry..................	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.............	100	1,000,000	550,000	....	--	16
Scranton Pa—Oct 15						
Scranton Railway Co...............	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16⅛	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Oct 15						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Oct 15						
Springfield Street Ry..............	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Oct 5						
Springfield Street Ry..............	100	1,200,000	1,166,700	4 % A.	207	212
Toronto Canada.—Oct 15						
Toronto Street Ry..................	100	6,000,000	6,000,000	1¾ % S.	§ 100¾	102¼
Montreal Street Railway Co........	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Oct 15						
Belt Ry. Co.........................	50	500,000	500,000	....	--	--
Capital Traction Co................	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co....................	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.....	50	200,000	200,000	....	20	21
Metropolitan RR. Co..............	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Oct 15						
*Worcester Traction Co........com.	100	3,000,000	3,000,000	....	30	31½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1899	...	85
Wilkesbarre, Pa.—Oct 15						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

Name.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 15						
American Bell Tel Co..............	100	50,000,000	28,650,000	4½ % Q., Jan.	141½	142
Erie Telegraph & Telephone Co..	100	......	......	1 % Q., Feb. 20,	95	96
New England Telephone Co........	..	10,894,600	10,204,600	$1.50 p. sh. Feb	123½	125
New York.—Oct :						
American Telegraph & Cable Co...	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.....	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co..............	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co..............	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.........	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co...	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.......	..	......	97,370,000	1¼ %, Q, Jan. '99.	79	79¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Oct 15						
American Dist. Teleg. (Phila.).....	25	400,000	......	1 % Q.	26	87
Bell Teleph. Co. (of Canada.)......	100	8,960,000	8,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co..............	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.......	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.......	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Name	Par	Authorz'd	Issued	Rate and Date of Last Div.	Bid	Asked
Boston, Mass.—Oct						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	142½	133
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	28
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Oct 15						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,938,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	..	..
Edison Ore Milling Co..............	100	......	......	....	8	12
Electric Vehicle Co..............com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q.,Apr., 1900	142½	143
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,0 00	A. & O.	110	125
Pittsburg, Pa—Oct 15						
Allegheny County Light Co.........	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.........	50	800,000	800,000	Q	--	--
Philadelphia, Pa.—Oct 15						
Edison Electric Light Co...........	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	50	60
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	55	65
Northern Elec. Light & Power Co..	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Oct 5						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co..............	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.......	100	......	......	....	118¼	120
Royal Elec. Co. (Montreal).........	..	1,000,000	.....	2% Q ‡	193	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1¾ % Q	183¾	185
Thomson-Houston Welding Co.......	100	......	......	3 % S, Dec. 1, 96.	..	100
Woonsocket (R. I.) Electric Co.....	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Name	Par	Authorz'd	Issued	Rate and Date of Last Div.	Bid	Asked
Boston Mass.—Oct 15:						
American Electric Heating Co........	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Oct 15:						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Oct 5						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	3¼	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	--	162
Welsbach Commercial Co.....com.	100	8,500,000	......	----	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co..................	5	525,100	......	....	43	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Oct 15						
Carborundum Mfg. Co..............	100	200,000	200,000	....	--	..
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Oct 15						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	18	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co..............	25	......	....	....	32	--
Consol. Car Heating Co.............	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co.....................	100	....	....	----	105	109
*Pratt & Whitney Co............com.	100	......	....	----	2	4
*Pratt & Whitney Co.............pfd	100	....	......	----	40	50
Stillwell-Bierce Co..............com.	--	....	....	----	--	50
Stillwell-Bierce Co..............pfd.	--	....	....	2 % Sept 1,'99.	70	65
Shults Belting Co..................	100	500,000	....	....	80	90
St. Charles Car Co.................		....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Oct 15, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1937	J. & J.	117½	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*128	127½
‡Watervliet Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co....................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co...... 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Oct 15, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	350,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
†Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‡W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‡Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	531,000	531,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Oct 15, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	.....	...
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Oct 15 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry....1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry...................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Oct 15 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	.....
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s	100,000	24,000	1912	M & S	......	....

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.. cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Oct 15 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	....
Bleecker St & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5%.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6%.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.) ...1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,035,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Oct 15 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Oct 15 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry........... 1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry...................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry.....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry......................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	367,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J. &	......	....
Philadelphia Trac. Co.........Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	--	.....
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	...	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg. Pa.

Date of Quotation—Oct 15 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	....	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1923	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	.....
Second Ave. Traction Co......................5s.	2,500,000	2,033,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Oct 15 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Oct 15, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s	2 000,000	1,500,000	1907	J & J	109	109½
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J & J	17	

*With interest. *Unlisted.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods	Bid.	Asked.
St. Louis. *Date of Quotation* Oct 15, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1906	M. & N.	108	105
Lindell Ry. Co..........................1st mtg. 5s	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	500,000	1916	M. & S.	105	106
†Mound City RR. Co...............1st mtg. 6s	400,000	200,000	1910	A. & O.	100	102
People's RR. Co.......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co.......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.......................1st mtg. 5s.	2,000,000	2,000,000	1906	M. & N.	99½	100¼
St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	108	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
§$200,000 in escrow to retire 1st & 2d mtg.
‖$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Washington D. C. *Date of Quotation*—Oct 15, 1900						
Belt Ry. Co.........................C[illegible] mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..............................[illegible] mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 15, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	.. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,360,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,931,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N. J.).Cons. mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N. J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	439,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	103	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$62),000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Oct 15 1900						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston...	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*—Oct 15, 1900						
Allegheny County Light Co................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Oct 15, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,312,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¾	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	......	.. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 15 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	. .
Northwestern Telegraph Co................7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	103	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 15, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	......	....	1904	J & D.	......	......
Worthington ‡Pump Co........................	75,000	....	......	....	115	127

‡Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16⅜@16½c.; Lake, 16¾@16⅞c.; casting, 16½@16⅝c.

Directors of the St. Louis Transit Company have declared a quarterly dividend of 1¼ per cent. on the preferred stock.

The Milwaukee Street Railway has decided to spend $1,000,000 on its Milwaukee property within the next five years.

The Gas & Electric Company of Bergen County (N. J.) reports for September: Gross earnings, $20,730; operating expenses, $12,392; net earnings, $8,338.

The Manhattan Railway Company, of New York, has offered to lend six months' money at 5 per cent. on 20 per cent. industrial collateral.

The United Electric securities Company of Boston has declared a regular semi-annual dividend of 3½ per cent on its preferred stock, payable November 1 to stock of record October 21.

A dispatch from Chicago states that if the city council will give the Chicago Union Traction Company permission, all its North Side lines will be equipped with electricity. For this purpose the company is ready to spend $1,000,000.

The reports that an amalgamation of the Metropolitan Street Railway Company and the Manhattan Elevated Railway Company of New York City is seriously contemplated or that any change in their present relations are likely, is strenuously denied by authorities close to the Manhattan management. Inside interests deprecate these reports as misleading and are set afloat simply to affect the stock market.

President J. C. Osgood, of the Colorado Fuel & Iron Company, says that the Mountain Telegraph Company, just incorporated with $1,000,000 capital, is a step by his company to operate telegraph service between the mines and plant of the company. It is found to be more economical than the present arrangement with the Western Union Telegraph Company. The incorporation was necessary because the charter rights of the Colorado Fuel Company do not include building telegraph lines.

Directors of the Edison Electric Illuminating Company of Boston have elected the following officers: President, C. L. Edgar; vice-president, Walter C. Baylies; clerk, J. Otis Wardwell; treasurer, Raymond Apollonio. The directors have declared a regular quarterly dividend of 2 per cent., and an extra of 1 per cent, payable November 1. Transfer books closed October 13, and open November 2. The stockholders at their meeting on October 9 elected C. W. Amory and Robert Bacon to the board of directors, succeeding C. H. Coster and Jacob C. Rogers, both deceased.

The condensed balance sheet of the Edison Electric Illuminating Company of Brooklyn, as of September 1, 1900, shows: Assets—Property account, $5,565,536; license account, $945,000; merger account, comprising stocks and bonds in other companies, $2 613,750; stocks and bonds in other companies, $402,115; construction material and supplies, $129,150; accounts receivable, $233,237; bills receivable, $8,806; cash, $43,214; total, $9,970,808. Liabilities—Capital stock, $5,000,000; first mortgage, 5 per cent. gold bonds, $1,072,000; consolidated mortgage 4 per cent. gold bonds, $2 935,000; depreciation expense account, $200,000; bills payable; $275,000; accounts payable, $220,209; accrued interest on bonds, $223,383; profit and loss, $45,216; total, $9,970,808.

At a special meeting of Western Union Telegraph Company's stockholders on October 10, the issue of $20,000,000 4½ per cent. funding and real estate mortgage 50-year gold bonds was duly authorized. Of these bonds $10,000,000 were duly issued and the 6 per cent. and 7 per cent. bonds, due March 1 and May 1, 1900, were discharged and cancelled on the dates of their maturity. The annual report shows an increase during the year of 2,849 miles of poles, and an increase of 28,500 miles of wire; an increase of 615 offices, an increase of 1,769,626 messages transmitted, an average rate of 30.8 cents received for each message, and the average cost of each message 25.1 cents. E. H. Harriman and Charles Lockhart were elected directors in the places of Alonzo B. Cornell and C. P. Huntington, deceased. Other members of the present board were re-elected.

An official of the New England Electric Vehicle Company says: "The New England Transportation Company, originally had $2,250,000 in cash. About one-half of this has been invested in plant, real estate and the business generally, leaving a balance, which is in bank at 2 per cent. interest, of about $1,125,000. This would be equivalent to about $5 a share on the stock, or nearly $2 per share above the current market price of the stock, to say nothing of the company's plant, equipment, etc. For the year from October 1, 1899, to October 1, 1900, the receipts of the Company in Boston were about $100,000 and the expenses $290,000. This loss was due to the disadvantages under which the company had to operate during the first year. For the current month the Boston business shows a profit over expenses, and the net earnings during the twelve months ending October 1, 1901, should, I believe, be in the neigborhood of $50,000 or $60,000, at least."

It is said to be the purpose of the Massachusetts Electric Companies to ultimately consolidate its 40 different street railways into four operating companies. This is in a fair way for early accomplishment, says the Boston "News Bureau." Within a short time all the lines north of Boston will be consolidated with either the Lynn & Boston or the Lowell, Lawrence & Haverhill. To the south of Boston the West Roxbury & Roslindale Company will eventually control all the roads. At present there are three operating roads on the South Shore; the West Roxbury line, Brockton and Taunton roads, or there will be, when the South Shore & Boston is consolidated with the Brockton Company and the Globe Street Railway of Fall River is consolidated with the Taunton Company. Petitions for such consolidations are now before the railroad commissioners. The three Rhode Island properties will be consolidated into the Newport & Fall River Street Railway Company. These consolidations will greatly facilitate the operation of the properties.

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ELECTRICITY.

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EDITORIAL NOTES.

Electric Haulage for Canals.

In view of the fact that it will probably not be many years before the principal canals or waterways in this country will be permanently provided with electric systems for towing canal-boats what is being done along this line abroad should prove interesting.

The various electric schemes so far suggested for moving canal-boats may be briefly, and in a general way, divided into three systems: That of moving a canal-boat by means of a portable motor outfit placed on the boat itself; that of drawing one or more boats through a canal by means of an ærial carriage supported on cables running along the bank, and lastly, that system in which an electric tractor or locomotive running along the bank itself is made use of. The latter method would seem to be the most popular just at present and numerous experiments are being made, especially in Germany and France. About a year ago such a system of canal towage, then recently installed on a waterway between Dortmund and Emshäfen in Germany, was described in these columns, while not long ago electric tractors were given a trial on a short length of the Finow Canal, which forms a portion of the waterway between Berlin and Stettin. These experiments were made on behalf of the Prussian Government and are described by the Consul General of the United States at Frankfort.

The crafts that run on the canal are in the the main barges, some 132 feet long by 115 feet 6 inches beam, carrying 150 to 175 tons. There are also a few steam barges employed, which carry about 150 tons and can tow a second barge. The traffic to Berlin is much heavier than toward Stettin, and as a consequence thee-fourths of the barges return light from the metropolis. Traction is generally effected by horses, there being a towpath on each bank, but on the down journey man traction is not infrequently relied on. In any case the speed is low, and, including stops, does not average more than 1¼ miles per hour.

The section of canal used for the experiments was selected owing to its physical difficulties, presenting, as it does, several curves, in one of which with only 328 feet radius the waterway is spanned by a railway bridge. The line laid down for the towing engine was of 1 meter (3.28 feet) gauge, the outer rail weighing 18.2 pounds per yard, while the inner, which was fixed on the inner edge of the towpath, weighed 9.1 pounds per yard. These rails, which were of the flange type, were laid partly on sleepers ballasted with gravel and partly on blocks of concrete, weighing 220 pounds each in the case of the heavier principal rail, and half this in case of the other rail. This arrangement costs more per mile than the sleepers, but has been found less expensive to maintain. Though no wharf actually existed on the length of canal experimented on, the arrangements necessary were fully tested. At one point the line was raised to a height of 9 feet 6 inches above the level of the towpath, being carried on posts and brackets. The carrying posts were 12 inches in diameter, and were spaced at 18 feet 8 inches. A cap piece spanned the gap between the posts, and the principal rail was laid directly on this cap piece, while the other was carried by a stringer supported at each post on brackets.

The conductor for the current was supported on pine posts 23 feet long, located 35 to 44 yards apart. It consisted of 8-millimeter wire, carried by porcelain insulators. The principal rail served as conductor for the return current. The source of power was a 15 horse-power portable engine, driving a 9 kilowatt dynamo, and a large storage battery was also provided. The extreme dimensions of the towing locomotive were 6 feet 10 inches in length by 4 feet 10 inches wide. Its total weight was 2 tons; but the motor was so placed that only one-fifth of this total came on the accessory rail The motor provided was much more powerful than necessary for the work in hand, as it was capable of working at the rate of 14 to 15 horsepower. Since, however, these experiments were merely preliminary ones, intended to test the possibilities of electric traction for large barges, the excess power was supplied intentionally, and the resistance requisite to call forth the full powers of the motors was in some of the experiments provided by rafts. These experiments showed the system to be capable of meeting all needs, working, as it did, with safety and economy.

Another system referred to briefly in our last issue was recently given a trial between Béthune and L'Escaut in France, a distance of 47 miles. In this case the tractive apparatus consisted of electric haulers, each weighing two tons. They are mounted upon four wheels, of which two are driven. The length of a hauler is 14 feet and the breadth 4½ feet. In this sys-

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tem current at 500 volts is derived in the ordinary manner from an overhead conductor.

The advantage of electric haulage over that of steam or animal is forcibly demonstrated when it is stated that with the latter it was shown to cost .213 cent to haul one kilometric ton, whereas, when an electric hauler is made use of, this figure is reduced to .142 cent.

If the figures given are correct, and there would seem to be no valid reason for doubting it, it would certainly pay to install at as early a date as possible permanent electric haulage systems along the various canals in this country.

* * *

Motor Power Schemes Abroad. There are at the present time a number of large water-power schemes in contemplation or in course of construction. One of these is at Niagara Falls, a description of which will be found in last week's ELECTRICITY. The other schemes we refer to are in Sweden and Switzerland. At Vestmanland in the former country a power plant has been in course of construction which, when completed and in running order, will deliver current for lighting and manufacturing to Vesteras, a town 14 miles distant. The power for operating the turbines, of which there are six, is derived from the Kolbock River. The latter has been dammed, and from its north side the water passes to the power-house through a canal 1,130 feet long, 23 feet broad and 8 feet in depth. The water is led to the turbines through three pipes 8 feet in diameter. The current from the six generators is collected and conveyed to 18 transformers where the voltage is raised from 800 to 14,000. After passing over the three copper conductors to the town the tension is again reduced through the same number and size of transformers and distributed to the various consumers.

The Swiss scheme is a most extensive one. It is described in detail in a recent issue of the "Bulletin" of the Société des Ingénieurs Civils de France, and has been abstracted and translated by the London "Electrical Engineer." The scheme, or, more properly speaking, schemes, consist in utilizing the waters of the river Rhone. From Pyromont to Fort de l'Ecluse the Rhone falls rapidly through a series of gorges and drops 210 feet in a distance of 12½ miles. Attention is called to the fact that the Lake of Geneva acts as a reservoir in regulating the flow, and that the minimum amount of water passing down the river is at least 5,250 cubic feet per second. From this data it is computed that the minimum effective horse-power which can be obtained in the driest months is 100,000, while for nine or ten months in the year one could depend on getting at least 200,000 hp. Up to the present the only quantity used amounts to 10,000 hp., which is obtained by an Anglo-Swiss company, but there are three schemes on foot organized by French concerns, which only wait for the formal sanction of the authorities before commencing work.

The first of these schemes, which would have its works about 2½ miles from Bellegarde, would, when completed, be able to provide 25,000 hp. even in the winter months when the river is lowest. The next scheme takes its name from the Joucle du Rhone, and would develop 30,000 hp. from a fall about 90 feet. In the third scheme the fall utilized is above Bellegarde, and here again 30,000 hp. is expected to be obtained. The horse-power which it is proposed to develop at these three power-stations would be largely used for electro-chemical and electro-metallurgical purposes, but current would also be transmitted to industrial centers within a radius of 100 miles. The article states that the various promoters think that $10 per horse-power hour per annum will repay for the cost of the works, and this will be about one-tenth of the cost of the horse-power per annum in the district when obtained from coal.

From the foregoing it will be seen that this country is not the only one in which mammoth water-power enterprises are being agitated and constructed.

* * *

The American Street Railway Convention. The Nineteenth Annual Meeting of the American Street Railway Association, recently held in Kansas City, Mo., proved satisfactory in every way. The papers presented, though few in number, contained an unusual amount of useful and interesting information, especially the one entitled "Double Truck Cars: How to Construct and Equip Them to Obtain Maximum Efficiency with Minimum Cost of Maintenance." This paper, which was read by Mr. N. H. Heft, brought out a very lengthy and valuable discussion, which we hope to find space for in a subsequent issue.

As usual, there was a very large number of material men on hand, and, as a result, the exhibition of street railway appliances was most interesting.

The social features were everything that could be desired, opportunity being afforded the members of enjoying a theater party, trolley ride and the usual banquet.

The proceedings of the Convention in detail will be found elsewhere in this issue.

* * *

American Trade Interests Abroad. It has been aptly said by someone that we are living in a commercial age; all the energies of the human race are focused on the goal - commerce. Our country has been called the workshop of the world.

A solution for many of the complex problems that are causing anxious thought to those who have the Nation's best welfare at heart may be found in the expansion of American trade. Every year there is an increase in our production for exportation greater than that for our home consumption. And yet it is safe to say that our export trade is only in its infancy. To-day we rank as the third commercial nation, and this without any special effort being made to so hold ourselves. The growth has been very gradual and natural, foreign countries being the solicitors rather than the solicited. Our manufacturers are only just beginning to realize the immensity of the field for export trade that is awaiting systematic effort to reach it.

There are many obstacles to be overcome before we will be able to throw the whole weight of our resources on the markets of the world. Without a thorough study of the needs of foreign peoples our manufacturers will ever find export trade to be uphill work. Every year it becomes more apparent how much we stand in need of specially trained men to represent American trade interests abroad. Only such men can obtain satisfactory results after they have received an education preparatory to such work. Commercial and industrial education is one of the signs of the times, and the quicker American manufacturers grasp this point the better it will be for the export trade.

What is needed, for example, is to apply the admirably arranged commercial and technical school system of Germany to our own methods. Having made this our own we would be in a position to take an interesting part in the irresistible aggression in the struggle for foreign markets.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

GENERAL Greely has lately received a report from Manila saying that sixty miles of cable for use in the Philippines have arrived, and will enable the signal corps to complete a number of telegraph lines in the islands.

THE structural work on the new electric tramway for the city of Glasgow, Scotland, which the Riter & Conley Manufacturing Company of Pittsburg, Pa., has been building for the past year, is so nearly completed that the company expects to order the men at work there to return home in about two weeks. The new line covers a number of the streets of Glasgow and is built almost exclusively of American steel.

ACCORDING to news recently received from Paris the Autombile Club de France has decided in conjunction with the German Club to hold a race from Paris to Berlin early next year. Emperor William has promised prizes to the value of $10,000.

MR. C. W. SQUIER, who has been employed for some years in the General Electric Works at Schenectady, N. Y., has accepted a position with the Sprague Electric Company at Bloomfield, N. J., and will have charge of the controller department.

A HIGHLY ingenious apparatus for discharging an electric line of high pressure electrostatic charges, or of those due to lightning, was tested with satisfactory results on several trolley lines during the past summer. It consists simply of a glass tube about a foot long filled with small shot. The shot is treated chemically before use to give it a light coating of lead carbonate, which is an indifferent conductor. This tube is provided with metallic ends and is connected in series, with a spark-gap between the line to be protected and the ground. To the rapid oscillating current of high pressure induced on the line by lightning the tube of shot offers practically no resistance and the discharge goes to earth. To the heavy trolley current, which at once begins to follow along the path made by the lightning discharge, the resistance of the shot is enormous and the current is at once broken. This action is very similar to that of the coherer, or tube of metallic filings, used in wireless telegraphy.

THE advent of electricity and the general advancement of science, says H. G. Gardner in the Washington, D. C., "Star," has brought new work to the bureau of weights and measures. It has also emphasized the need of adequate legislation under the constitutional power to provide the country with uniform standards. All over the land people are paying for electric light, and yet they have no standard by which to measure it or to guage the size

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of their bills except the say so of the company which furnishes it. There is no legal standard of measure and the "ohm," which is borrowed from Germany, may be a big or a little ohm as it suits the company to make it. There is no standard "candle-power," and there is no way for a customer to know whether his lamp is of a certain brilliancy or not. The same principle applies to the scale of electric power for the running of machinery. The United States has bought some testing apparatus for measuring volts and ohms from Germany, which is the source of all the best scientific equipment, but no effort has been made to furnish the States. The appropriation for this purpose has been entirely inadequate. The question of establishing an American standardizing bureau will come before Congress at next winter's session. A bill was introduced last December and was favorably reported by the House committee having it in charge. The Senate committee on commerce has not yet given it consideration. It is proposed to create a bureau with authority to undertake all functions contemplated by the clause in the Constitution relative to "fixing the standard of weights and measures."

MAIL advices from Buenos Ayres state that the use of electric motor cars in the Argentine capital is developing rapidly. Not only heavy delivery wagons, but also luxurious carriages operated by electricity are frequently to be met with on the streets of that city. The roads are gradually being improved, and a touring club has been formed with a view to watching over the interests of automobilism. One of the first resolutions of this club, the members of which comprise many merchants and influential amateurs, has been to establish throughout all the provinces of the republic, roads specially reserved for light motor cars and bicycles. These roads already radiate from Buenos Ayres for a distance of from 60 to 70 miles, and the work will be continued till a netword of similar roads exist all over the country.

TROLLEY cars, like other things, will wear out, and in Brooklyn, when they reach this condition, after being divested of everything that can be made use of, they are then cremated. A thousand and more have already been destroyed in this manner; scores of others will meet the same fate. The foreman of this odd wrecking gang sets the match to them himself, piling up in each car cotton-waste and fragments of wood, pouring kerosene about liberally.

ON the shelves at the Patent Office at Washington, D. C., are scores of modest models of inventions the world could not now well do without. The greatest inventions have been but the crude beginning of some idea subsequently perfected. The models seem to partake of the same crudity. Take the telephone, for instance. In the Patent Office are two cones of wood with membraneous ends and a confusing tangle of metal and wire. Each of the cones could be hidden in one's hand. Yet they are the beginning of an idea that has been perfected to the elaborate instrument of today, out of which millions have been made, and by the use of which continents are bridged. No one at first glance would associate these insignificant bits of wood and metal with the telephone of to-day. Of scarcely less commercial importance are the arc and incandescent lights. The arc-light has undergone little change in general form since it was patented by Colner and Baker on May 18, 1858. There have been wonderful changes in its mechanism, but the hour-glass form of the first model is still preserved. With the incandescent light it is different. There is not the slightest resemblance between the first model and the bulb light of to-day.

CAPTAIN SIGSBEE, Chief of the Naval Bureau of Intelligence, has received from Lieutenant Louis R. de Steiguer, U. S. N., an interesting report on the use of electricity on board naval vessels. It is shown that within a few years the motor has supplanted all else in operating the auxiliary machinery of war vessels of all classes, and it is believed that before many years a very elaborate system will have been invented whereby electricity will do almost everything required on a battle-ship. The rereport is made from observations and inspection of the vessels of the United States and foreign navies.

EAST CLEVELAND, O., will soon have an automatic water-pumping system, driven by electric motors. Current will be supplied from Cleveland, and the pumps will be run without any further attention than an occasional oiling. The water, taken from the 10-inch Cleveland main, will be forced up the hill back of the village into a large steel reservoir. The height of the reservoir is sufficient, not only to give the house pressure required, but will be enough for fire-plugs, thus enabling the local fire companies to dispense entirely with their old fire-engines.

A NOVEL electric sign with over fous thousand lights, and which cost about $10,000, is located on the Detroit River at Walkerville, Mich.

C. J. FIELD, chairman of the technical committee of the Automobile Club of America, has announced the programme of track tests for automobiles during the coming automobile show in Madison Square Garden of this city, from November 3 to 10. All of the events, except those for Friday, November 9, will be open only to the vehicles in the exhibit. The list of track tests includes, among other things, a brake contest for electric vehicles, an obstacle contest for electric vehicles, and similar tests for gasoline and steam automobiles. In addition to the exhibition of new machines, there will be a number of foreign carriages shown by members of the Automobile Club of America, under whose auspices the show will be given. A. C. Bostwick will exhibit his new French record-holder, of twenty-four horse power; D. W. Bishop will show his sixteen horse power French carriage of the same make; S. T. Davis, Jr., a steam-racing carriage; A. L. Riker, an electric racing carriage, and Alex Winton, a gasoline racing carriage. The firms exhibiting vehicles will have stored at the east end of the Garden between fifty and seventy-five carriages, which will be run on the track, and it is the intention of the management to have from twenty to twenty-five carriages moving on the track at all times during the show, except when competitions are on.

THE Sprague Electric Company has secured the contract for ventilating the beautiful new Grand Central Depot, New York City. The ventilating fans, ranging in size from 18 to 60 inches, will be operated by the well-known Lundell electric motors.

American Street Railway Association Convention.

Synopsis of the Proceedings at Kansas City —Walton H. Holmes Elected President— The Next Convention to be Held in New York City—Meetings Hereafter to be Limited to Three Days Instead of Four.

The Nineteenth Annual Meeting of the American Street Railway Association was called to order by President John M. Roach at the Convention Hall, Kansas City, Mo., at 11:15 A.M. October 16. The President said:

Gentlemen, you will please come to order. The first business of the session this morning will be an address of welcome. We have a distinguished citizen of this city with us this morning and he will extend a welcome to you. I take great pleasure in introducing to you his honor, James A. Reed, Mayor of Kansas City. (Applause.)

Mayor Reed then delivered the address of welcome, and, among other things, said:

Mr. President and Gentlemen: I do not know whether I can make you hear me this morning or not. My voice, which usually is as soft and as musical as the notes of a flute wafted over moonlit waters, has been laid on the altar of my country to such an extent in the last few days that I imagine it bears a distinct resemblance to the inharmonious blending of the sounds of a cracked fiddle and the roar of a buzz-saw. If I can make you hear, and say something to make you feel at home in this city, I shall be delighted. I esteem it, Mr. President and gentlemen, a great honor to address this body of distinguished gentlemen, which possibly resembles the funeral of Abel, which was small but select; none but the first families were present. (Laughter.) I trust that your meeting here in this roof garden is not being held under that part of the Scriptures which states that "The wicked dwell in high places." (Laughter.) In the little I have to say to you, gentlemen, I shall not bore you with a speech, because I do not know what purpose a speech serves on an occasion of this kind. The old Egyptians had a custom, so it is related, when they had a feast and everybody was feeling hilarious and good-natured—they had a pleasant custom of passing around a skull and saying to each of the guests "Remember you are mortal, remember you are mortal." I apprehend I was brought here to represent the skull and cross-bones of this occasion. You are here to transact important business, having important objects in view, and it is not a time for speech-making. It is a time when you desire to deliberate and get to business. I want to say on behalf of this city that Kansas City, as much as any other city in the world, welcomes to her midst the representative business men of all other cities. We believe out here in the West that it takes capital, brains and courage to build cities. We know out here in the West that if capital comes to us it must come because it expects a fair remuneration; and I want to call your attention, gentlemen, to the fact that you are in Missouri, and, notwithstanding the fact that all of the States that surround us, in times past, in those troublous times, when there were hard financial conditions existing, while every other State in the Union, almost—I will qualify it by saying when nearly all the Western States—placed upon their statute books laws aimed at the destruc-

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tion of the wealth of financial institutions, there never has been a syllable, line or sentence of what we commonly denominate crank legislation placed upon the statute books of Missouri. (Applause.) I need not extend to you the liberty of this city. That old phrase died years ago, and then I never saw a lot of street car magnates in my life that needed the liberties of a city; they generally know how to get them (laughter); but you are welcome here among us, and I know you will be made to feel at home, because I know the Messrs. Holmes, and their associates in business here will make you feel welcome and at home. You may read something in the papers here of police outrages, but if, perchance, you lose your way, for that is all would ever happen to so distinguished a body of gentlemen as you are—if perchance you do lose your way, I guarantee you that some good police-officer, like a good Samaritan, will conduct you to your hotel in peace and with due dignity, and, if necessary, will take you up the back way.

President Roach—Mr. Mayor, on behalf of the Association, I desire to thank you for your eloquent words of welcome spoken to us, and also to give you my personal thanks.

The first business at this meeting is the calling of the roll. If it is the pleasure of the meeting, instead of taking time to call the roll, the official registration of the Secretary will be deemed the calling of the roll. That has been the custom in the past, and will be considered as applying at this time, if there is no objection. We now extend an invitation to those companies represented at this meeting which do not belong to our Association to join us, if there be any here of that class: or if the representatives of such companies have not time to do this at present they can do so later by applying to Secretary Penington.

The next business before the meeting is the address of the President.

President Roach then read the following address:

The President's Address.

Gentlemen—It gives me great pleasure to meet with you in this magnificent Western city. I have every assurance that nothing will be left undone to make our visit most pleasant and profitable. There is a breadth of character and freedom, of personality in this young metropolis of the plains which peculiarly appeals to the business man who has large interests entrusted to his care, and I believe the members of the Association will show their appreciation of the many pleasant things provided for their entertainment while in this community. When this Nineteenth Annual Convention of the American Street Railway Association shall have finished its labors, I am sure that I may safely say to Mayor Reed that none of you will have regretted the hospitality of the people of Kansas City, so graciously extended by him.

I see before me representative men from all the leading cities of this country. To your hands is entrusted street railway investments aggregating hundreds of millions of dollars and the welfare of over a million persons. From the single track, one-horse car of forty years ago, the business in which you are engaged has grown to a magnificence where nearly all fields of human endeavor are called upon to perfect its equipment or aid in its management. It has outgrown ridicule and financial instability and in the rapid whirl of events has built cities, enriched its promoters and made possible a freer, healthier and happier life for its patrons. Each day the street car is entering more and more into the business life and pleasures of the community, and each day its benefits are becoming more apparent to the general public.

The street railways of America now represent the enormous investment in bonds and stocks of $1,800,000,000 upon which investors are receiving annually over $70,000,000 in dividends and interest. Salaries and wages amounting to $250,000,000 a year are distributed among the 300,000 employes necessary to equip, operate and manage this great industry, repair its 20,000 miles of track, handle its 60,000 cars and meet the ever-pressing demand for improvement. Directly and indirectly over 1,200,000 persons depend on the traction interests of America for their livelihood.

An industry of such proportions penetrates and more or less affects all other enterprises in the country which sustains it. Nine-tenths of the business men and women of the United States look to the management of street railway companies to furnish them with swift, comfortable and safe transportation to and from business. Still a greater per cent. of pleasure seekers demand and receive from the same management to and from theater, casino, park and suburb, transportation of such elegance of equipment and efficiency in service as to satisfy the most exacting. It has required heroism and patience on the part of street railway men, with so little friction, to meet the demand of a critical patronage in so excellent a manner as is being accomplished by them at the present time.

On all sides, we hear the cry of improvement and in every direction we hear the sound of the busy car shop as it responds to the demand for more modern equipment. The public is becoming more exacting and there is need for the most perfect knowledge and the widest experience to successfully cope with the ever-changing situations which confront the street railway manager. Street railway companies have frequently, at great cost, increased their miles of tracks and added to an extensive equipment, primarily for the sole purpose of accommodating the public, by penetrating into outlying districts, unwarranted by additional business to be acquired in such territory. This policy has proved wise in nearly every instance. It requires considerable pluck on the part of a company to back a temporary loss in order to please its patrons. Those companies which have pursued such a course have generally been rewarded by more liberality on the part of municipalities, more good nature and praise from patrons and an early increase in the new districts acquired, which soon brought those lines to a paying basis.

In thus catering to the wishes of the public the street railway industry of the United States has been brought to a high standard of excellence and has kept safely in advance of traffic. The aggregate of miles of track has grown from a few hundred miles of single track, confined mainly to business centers, to many thousands of miles of thoroughly equipped double tracks, which have brought the country districts within quick and active touch with the larger cities. Such energy and management must and will be appreciated and fairly treated by the communities benefited.

It may be declared that corporations are without soul, but it cannot truthfully be said that street railway corporations are lacking in good sense or business principles. False economic doctrines yield to and flee before rapid development and prosperity. A well-equipped street railway with modern service, which seeks to oblige the people, operated in any community, will develop the best resources thereof, and bring prosperity to its people with such rapidity as to utterly confuse and put to flight all false economic doctrines.

Newspapers, reviews, magazines, periodicals and journals of this country, indeed of many parts of the world, are entitled to the thanks of this Association for the fair and generous treatment accorded in their columns to the street railway men and their interests during the year. It is the province of these publications to exploit the great industries of the land. If upon one day we are able to congratulate ourselves upon their unstinted praise, we should patiently bear the publicity of our faults, if any there be, in the next issue.

The last year has been a period of notable activity and healthy progress, with but few disturbances of a serious nature. The managers of large street railway properties should shape their policy toward their employes, and the public, so that disturbances between employer and employe will be entirely eliminated from their history. The management of the great corporations of the country can best retain the adherence and loyalty of employes by adopting toward them a policy at all times just, and at the same time courteous, kind and conciliatory. The good will of your employes and of your patrons will be found an asset of great value in the days of trouble and most desirable at all times.

A business so widespread in its usefulness, holding and judiciously employing as it does so great a portion of the capital of the country, and so essential to the best interests and prosperity of the trade centers, should, and I believe in good time will, possess the very necessary good will and hearty support of the municipalities it so faithfully serves. Our interests and those of the public are inseparable interwoven and naturally harmonious. If such interests become strained, therefore, it should become one of the leading features of our Association to suggest a uniform policy for street railway companies, of so broad a gauge that the mutuality of the best interests of the public and of the company shall be as apparent to the people as to the street railway managers themselves.

I take pride in announcing that the condition of your Association, both as to membership and finances, is improving each year. I wish to urge you to make this gathering of use to our Association and of importance to the street railway industry. This may be accomplished by a full attendance upon and participation in the business meetings. The Executive Committee has selected members who have prepared papers on important subjects and I urge upon you the advisability of entering into full discussions and analysis of these subjects so that a clear understanding of all questions presented may be carried home with you. I also urge the Association to show appreciation for our friends, the supply men, who have produced for this annual meeting their splendid exhibit.

Allow me to request your hearty support in the work of the Accountants' Association, which meets in annual convention here at this time. Its work is of great importance and is worthy of your most serious consideration.

To the Secretary and members of the Executive Committee our thanks are due for the satisfactory manner in which they have assisted in

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conducting the affairs of this Association. Personally their efforts have been highly appreciated.

The honor of having acted as your President for the last year has been most gratifying to me and shall ever remain one of the pleasant recollections of my life as a street railway man. For my successor, I bespeak the same courtesy and cordial co-operation which it has been my good fortune to enjoy. Gentlemen, I thank you.

The President—The next business in order is the report of the Executive Committee.

The report was then read by Secretary Penington.

The President—Gentlemen, you have heard the report of the Executive Committee. What is your pleasure?

Mr. Dyer, Augusta—I move that the report of the Executive Committee be adopted as read.

Motion carried.

Mr. McCulloch, Chicago—Mr. President and Gentlemen: I think it is due to Mr. Durbin to state why he resigned his membership of the Executive Committee. Those of us who know him know he is not in the habit of shirking responsibilities. He has gone out of the street railway business

The Secretary—Mr. Durbin has gone out of the street railway business, and did not think he ought to continue to hold his office as a member of the Executive Committee.

The President—We will now hear the report of the Secretary and Treasurer.

The Secretary then read the report, which showed the receipts of the Association up to October 10, 1900, including $5,658.87 cash in bank, to be $12,223.42, and expenses up to the same date amounting to $5,222.67, leaving a balance in the bank of $7,000.75.

The President—Gentlemen, what action will you take upon the report of the Secretary and Treasurer?

Mr. Graham, Quincy—I move that the report be received and placed on file.

Motion carried.

The President—The next business before the Convention will be the reading of a paper by Mr. Daniel B. Holmes, counsel of the Metropolitan Street Railway Company, Kansas City, Mo., on the subject "Consolidation of Street Railways and its Effect Upon the Public."

The paper was then read by Mr. Holmes, after which the President said:

Gentlemen, you have heard the paper read by Mr. Holmes. What action will you take in regard to it?

Mr. Rigg, Reading—I move that it be received and spread upon the minutes, and that we tender Mr. Holmes a vote of thanks for the interesting paper.

Motion carried.

The President—Mr. Holmes, I desire on behalf of the Association and personally to thank you for the very able and distinct manner in which you treated the subject embraced in your paper.

Mr. Holmes—I appreciate the compliment very much.

The President—Is there any gentleman present who would like to discuss the paper just read? We would be glad if anyone has anything to say to hear from him. I imagine the gentleman has treated the matter so comprehensively and in such a diplomatic manner there is very little additional that can be said. It is natural, under such circumstances, as he seems to have covered the ground so fully, for us to have passed this vote of thanks to him. I desire to state that, upon adjournment of this meeting, we shall hold a meeting of the Executive Committee.

After the announcement by the Secretary that there would be a reception at the Midland Hotel that evening the meeting adjourned.

WEDNESDAY—OCTOBER 17.

President Roach called the meeting to order at 10:50 A. M.

The President—For reasons unnecessary to explain at this time, we have changed the order of business somewhat. The names of the nominating committee have been selected, and the Secretary will now read them. This committee will also recommend to the Association a place for our next meeting.

The Secretary read the names of the commiteee on nominations as follows: Chairman, John A. Rigg, Reading, Pa.; E. C. Foster, Lynn. Mass.; E. G. Connette, Syracuse, N. Y.; D. B. Dyer, Augusta, Ga., and Robert McCulloch, Chicago, Ill.

The President—I would say to the gentlemen who have any idea of asking the Association to hold its next meeting in their city, that they can see Mr. Rigg, the chairman of the committee on nominations, any time at their convenience. Mr. Rigg will appoint a time and place for the meeting of the committee.

Secretary Penington—Mr. President, I will state that I have received invitations from the Mayor of Cincinnati, the President of the Cincinnati League, and from President Kilgour, of the Cincinnati Street Railway Company, asking us to hold the next Convention in that city. I will turn these invitations over to Mr. Rigg, chairman of the committee.

The President—The next order of business is the reading of papers. The first paper on the programme this morning is entitled "A Comparison of the Various Systems of Electrical Distribution for Street Railways," by Mr. C.F. Bancroft, electrical engineer of the Massachusetts Electric Companies, Boston. Mr. Bancroft is not in attendance at the meeting, and it will devolve upon the Secretary to read the paper.

The Secretary then read the paper, which elicited a discussion participated in by Messrs. Foster, Connette, Dyer and Wason.

The President—The next regular order of business is the reading of the paper on "Painting, Repainting and Maintenance of Car Bodies," by Mr. F. T. C. Brydges, superintendent of car shops, Chicago Union Traction Company, Chicago, Ill.

In the absence of the author the paper was read by the Secretary. A short discussion followed in which Messrs. Harrington and Foster took part.

The Secretary then announced that there would be a theater party in the evening at Coates Theater, after which the meeting adjourned to Thursday morning.

THURSDAY—OCTOBER 18.

The meeting was called to order by President Roach at 11:10 A.M.

The President—Gentlemen, we will proceed to the regular order of business this morning. The paper on the programme is entitled "Double Truck Cars: How to Construct and Equip Them to Obtain Maximum Efficiency with Minimum Cost of Maintenance." This paper is by Mr. N. H. Heft, president of the Meriden Street Railway Company, Meriden, Conn.

Mr. Heft then read the paper, which proved to be most interesting and which elicited a lengthy discussion, participated in by Messrs. Foster, Chamberlain, Heft, Harrington, Wason, Beggs, Vreeland and others.

President Roach—Gentlemen, the next order before the Convention is the report of the committee on nominations.

Mr. Rigg, chairman of the committee on nominations, then presented the following report:

Gentlemen—Your committee on nominations respectfully reports that it recommends New York City as its next place of meeting, and also recommends the following gentlemen for officers of the Association for the ensuing year.

For President—Walton H. Holmes, president Metropolitan Street Railway Company, Kansas City, Mo.

For Vice-President—Herbert H. Vreeland, president Metropolitan Street Railway Company, New York.

For Second Vice-President—N. H. Heft, president Meriden Electric Railroad Company, Meriden, Conn.

For Third Vice-President—J. B. McClary, general manager Birmingham Street Railway Company, Birmingham, Ala.

For Secretary and Treasurer—T. C. Penington, treasurer Chicago City Railway Company, Chicago, Ill.

Executive Committee—The President, Vice-Presidents, and John M. Roach, Chicago; F. L. Fuller, Wilkes-Barre, Pa.; George W. Baumhoff, St. Louis, Mo.; John R. Graham, Quincy, Mass., and John Harris, Cincinnati, O.

The following resolution was unanimously passed by the committee:

Resolved, That the next meeting of the American Street Railway Association be limited to three days instead of four, and that the day set apart for the personal examination, by members, of the supply men's exhibit, be the middle day of the interval.

President Roach—Gentlemen: The election of officers is by ballot, and I will select Mr. McCulloch of Chicago and Mr. Beggs of Milwaukee, to act as tellers.

Mr. Bean, St. Joseph—I move that the Secretary be authorized to cast the unanimous ballot of the meeting for the gentlemen nominated.

Motion carried.

The Secretary duly cast the ballot and the President declared the gentlemen nominated to be duly elected as officers of the Association for the ensuing year.

President Roach—There will be no further meeting of the Association, but we will adjourn until to-morrow night at 7 o'clock to meet at the Coates House for the annual dinner.

I desire to thank the members of this Association for their kind consideration while I have been your President, and if there is anything I can do at any time to help the Association, I will be pleased to have you call upon me while here and at home. (Applause).

Mr. Heft—I move that the thanks of the members of this Association be tendered to our able and genial President and the other officers of the Association, for the able manner in which they have conducted the affairs of the Association during the past year.

The motion was carried by a rising vote.

Mr. Vreeland—Before we adjourn, it would seem right along this line that it would be proper for this Association to express its appreciation of the entertainment that has been extended to the members of this Association by the Metropolitan Street Railway Company of Kansas City, and by the leading citizens of Kansas City, whose generosity has never been paralleled in my history in connection with associations of this character.

The motion was put and unanimously carried.

The meeting then adjourned.

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MEASUREMENT OF THE RESISTANCE OF CABLES.*

BY ARTHUR C. HEAP.

To conform to the requirements of recent specifications for electric light cables, it has become necessary for manufacturers to provide themselves with instruments which shall be capable of measuring the resistance not only of the samples of copper of which the cable is made, but also of the finished cable.

The measurement of the resistance of samples, where the copper is drawn into wire of suitable section, and where any desired length may be taken, can easily be done on the Wheatstone bridge; but when the resistances of short lengths of large section cable have to be measured, it is necessary to resort to one of the difference of potential methods. At the same time the instruments used must be accurate, direct reading, and quickly handled, and the connections must be such that they can easily be followed by the consulting engineer or his assistant, who may not be familiar with the particular test room in which he is working. Of these potential methods, the simplest is probably that in which the direct-reading potentiometer is used.

In England the low resistance potentiometer is, on account of its greater rapidity of working, almost universally employed.

The test consists in balancing the fall of potential produced by a current passing in a suitable length l (Fig. 1), of a slide wire, R, R, R,

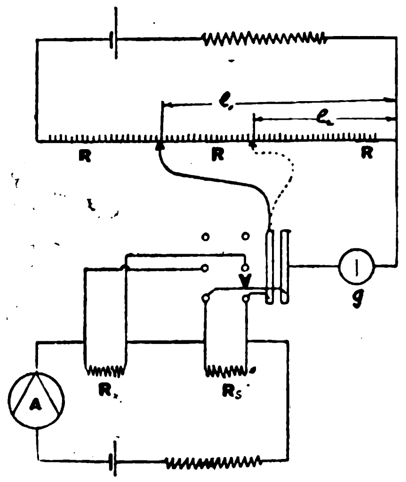

FIG. 1.

whose resistance per unit length has been accurately adjusted, against the fall of potential over a standard resistance, R_s of suitable value, the unknown resistance, R_x and the standard, R_s being connected in series in a circuit in which a constant current is maintained; the fall of potential over the unknown resistance is then, by moving the switch V, substituted for that over the standard, and the position, l_2, at which balance is obtained on the slide wire noted. The resistances are then directly proportional to the lengths, l_1 and l_2, of slide wire employed; that is,

$$R_x = R_s \times \frac{l_2}{l_1}.$$

The instruments necessary are, therefore, a potentiometer, in which the adjusted slide wire is conveniently arranged, a set of standard resistances, a sensitive low resistance D'Arsonval galvanometer, a secondary cell for maintaining a constant current in the slide wire, another for maintaining a constant current in the standard resistance circuit, a regulating resistance and ammeter for this circuit. Fig. 1 is a diagram illustrating the method; Figs 2, and 3 a particular form of potentiometer and standard resistance brought out by Messrs. Elliott Bros. In Figs. 1 and 2, R, R, R, is the adjusted slide wire, which is about 450 inches long, having a resistance of about 35ω, divided into 150 parts each of approximately 3 inches, by having small copper tags silver soldered to the wire; 149 of these are fixed by means of screws passing through holes in the ends of the copper tags to an ebonite ring, S, as shown, a second ebonite ring, T, carrying a contact

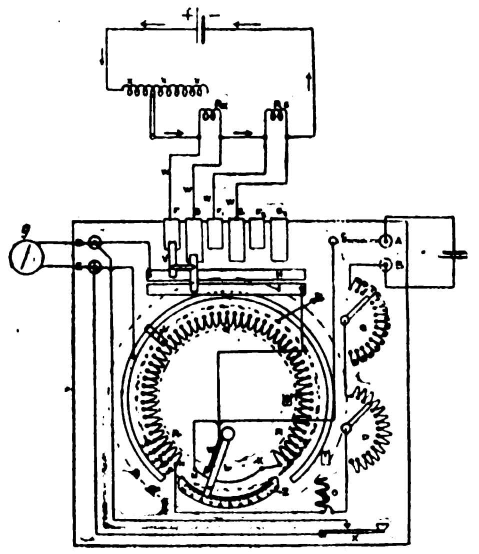

FIG. 2.

tongue, J, turns concentrically round the first ring on balls running in a ball race, U, cut between the two rings. This tongue, J, as it moves round makes contact on the heads of the screws fixing the slide wire; the outer ring T, is engraved with figures from 0—149 in such a manner that as they appear at a window, they indicate the number of the stud on which the tongue, J, is making contact. The 150th portion appears on the top of the instrument at MK, and is the portion on which the key, W, attached to the lever, L, makes contact; this lever travels over a graduated scale, Z, which indicates the position of the key.

The manufacturer's adjustment consists in making each of the 150 portions of the slide wire accurately equal to one another, and in calibrating the scale over which the key travels. O, P, Q, are resistances in series with the slide wire, R, R, R, and have no accurate ohmic values, but are such that O being the slow adjustment of approximately 1 ohm, the resistance between each two studs of P is about 0.95 ohm, and the resistance between each stud of Q is about 13.25 ohms, that is, they are overlapping rheostats, having a total resistance of about 188ω; G is a delicate d'Arsonval galvanometer, having a resistance of about 50 ohms; V is a multiple switch, having contacts F, G, F_1, G_1, etc., by means of which six different quantities can be compared; C is a fuse to protect the slide wire, and X is a shunt key to reduce the sensibility of the galvanometer.

As the range of resistances to be measured is wide, varying from 0.2 ohm for samples down to .00528 ohm, which is approximately the resistance of ¼ mile of 1 inch core cable, and even as low as .000025 for traction rail bonds, several standard resistances are required.

It is usual to supply—

1 ohm standard to carry 1.0 amperes.

$\frac{1}{10}$ ohm standard to carry 10.0 amperes.

$\frac{1}{100}$ ohm standard to carry 50.0 amperes.

$\frac{1}{1000}$ ohm standard to carry 500.0 amperes.

These resistances are mounted behind a switchboard, on the front of which there is a multiple contact switch, potential terminals, and ammeter complete, as shown in Fig. 3, and are connected up so that either standard can easily be put in circuit. In some cases two extra brushes are fixed on the main switch arm, but insulated from it, and these touch on studs corresponding to the potential terminals of the resistances, so that when the main switch is turned to a particular standard, the potential circuit is made at the same time, thus avoiding and moving of the potential leads, rendering mistakes impossible, and increasing the speed at which tests can be made. Some manufacturers prefer to have these standards made of copper and then to neglect all temperature corrections, but it is better to have manganin or other alloy standards with a negligible temperature coefficient, and this for two reasons, first, because the standards are very difficult to obtain accurately, and secondly, because the cable is usually in a tank at some distance from the standards, and therefore difference of temperature has to be allowed for.

To make a test, connect up the instruments as in Fig. 2, select the standard whose value is nearest to that of the wire or cable to be measured, regulate the current by the ammeter in the standard circuit to the required amount, set the switch, V, so that it makes contact on the studs corresponding to the terminals, F, G, to which the potential wires, W W, from the standard resistance, R are connected, set the

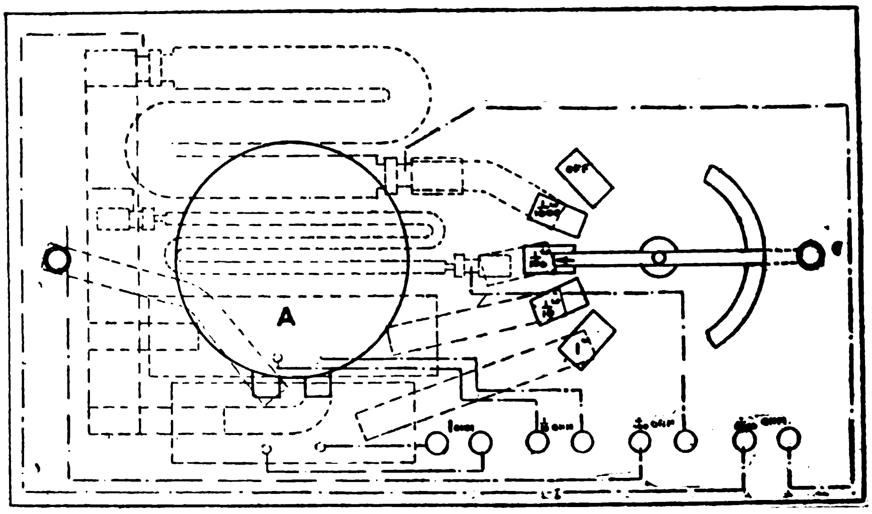

FIG. 3.

*From the "Electrical Review," London.

wheel, T, of the potentiometer so that a convenient figure, say 100, appears at the window, the key, W L, being at zero; obtain balance (no deflection of galvanometer when key is depressed) by varying the resistances, O, P, Q; now move the switch, V, on to contacts corresponding to W W, the potential wires from the cable R_x and move the wheel, T, and key, W L, until no current passes in the galvanometer; reading off the position of the wheel, T, at the window and of the key, W L, on the engraved scale, the resistances are proportional to these two positions of balance. Thus, supposing the 1 ohm standard to be in circuit and we balanced at 100 in the window and key at zero, and on turning the switch over to the unknown we obtained balance by setting the wheel to 40 and the key to 125 then the unknown resistance would be $\frac{40.125}{100} \times 1 = .40125$ ohm, that is, the instrument would read, direct if we read the figures straight from the wheel to the scale, thus .40125, the decimal place being seen at a glance.

Reference is made above to obtaining a balance by varying the resistance O, P, Q, until there is no deflection of the galvanometer; it is well to set these resistances approximately before putting down the galvanometer key, and thus avoid any banging over of the galvanometer coil and consequent disturbance of its zero.

These resistances may be calculated from the following formula:

$$\underset{\text{(Approx.)}}{O + P + Q} = \frac{E \times R \times l_1}{R \times I \times l} - R$$

Where E = E.M.F. of the battery on the potentiometer,

R = resistance of the standard in circuit,

I = current in R_s,

R = resistance of slide wire,

l_1 = position in scale divisions at which balance is wanted,

l = total length in scale division of slide wire.

The question often arises as to what current must be put through the standard resistances, so that accurate readings may be obtained without any fear of the cable being heated, and it is often stated that large currents have to be used in connection with potentiometer measurements. This is not the case, for rarely, except in the measurement of bond resistances, need a current exceeding 50 amperes to the square inch of copper be employed, and where, as is usual with cable makers, lengths of not less than one-eight of a mile are being measured, 10 amperes per square inch is ample.

For the measurement of the resistance of samples of copper wire a special board is provided, on which are mounted suitable current leading-in clamps for various sizes of wire, and knife edges at a definite distance apart, either 100 inches or 1 meter according to the standard with which the sample is to be compared, the knife edges acting as potential points; after the measurement of resistance a cutting knife is drawn over, and the wire nipped at exactly the 100 inches or 1 meter as required, this length being weighed in the usual manner.

The chief advantages gained in using the above instruments are:

The resistances of the potential wires between the cable standard and potentiometer do not come into the test, since when balance is obtained no current passes in the potential circuits; the cables can, therefore, be at some distance from the test house without any correction having to be made for connecting leads. The resistance is read direct in ohms, no calculation being necessary. Only four standard resistances are necessary to cover a very wide range of measurement; a six-dial Wheatstone bridge would have 68.

The potentiometer slide wire, except for a length of about 3 inches, is placed inside the containing box and therefore cannot be damaged, and as it is fixed on the under surface of the ebonite top, dust does not collect on the rubbing contacts.

The secret of successful potentiometer measurements is undoubtedly to keep the secondary cells in good working order.

THE ACCURATE MEASUREMENT OF ALTERNATING AND MULTIPHASE CURRENTS.*

BY G. L. ADDENBROOKE.

For many years past I have given much attention to this subject, and I have now the honor to lay the results of my experience and work before the International Congress. One main point which struck me several years ago was the desirability of looking at the question as a whole. In measuring alternating currents it is necessary to take into account the fact that if there is inductance or capacity in the circuit, as is usually the case, the current which flows is influenced by three factors: (1) The resistance of the circuit and the work done within it; (2) the inductance of the circuit; (3) the capacity of the circuit. The inductance and capacity effects being exactly opposite in phase, counterbalance each other as far as they can, the larger factor predominating, the phase of which will be either 90 deg. behind or in advance of the phase of the energy current, according as the self-induction or capacity of the circuit predominates. This current, when further combined with the energy current, produces a resultant current which is that actually flowing in the circuit, and which I prefer to call the "total" current rather than the "apparent" current and which, it is clear, will not be in phase with either of its components.

In carrying out the measurements in practice the wattmeter principle has come to be almost universally used in practice. Assuming that this principle is the one employed, there are three measurements which must be made to obtain the fundamental factors of an alternating current. When these factors are known other characteristics of the current can be deduced. A measurement must be made of: (1) The impressed volts; (2) the apparent amperes, or as I prefer to call them, the "total" amperes; (3) the effective amperes or watts. (If the effective watts are measured, knowing the impressed volts we can directly deduce the effective amperes.)

Having these quantities, we can directly deduce in addition the power factor, the angle of lag and the magnetizing or capacity current or their resultant, if both are present. Also, if we know the periodicity, the coefficient of self-induction of the circuit and other characteristics may also be obtained without further observations. Finally, if both inductance and capacity are present, by measuring this capacity we can with the above data find the inductance.

* Abstract of a paper read at the International Electricity Congress at Paris. From the "Electrician," London.

To adapt the electrometer for use as wattmeter I insert a series non-inductive resistance in the circuit to be measured, across which the quadrants are connected, while the needle is connected to the other side of the circuit so that the potential difference of the circuit is established between the needle and the quadrants. By arranging the instrument in this way and calibrating it properly, it is possible, under the right conditions, to make the electrometer a direct-reading wattmeter. Having the above-mentioned resistance necessarily in the circuit, it was clear that if it were possible to make an electrostatic voltmeter sufficiently sensitive to measure the drop of volts across this non-inductive resistance such an instrument so coupled would become a very handy form of ammeter. I have been able to attain such sensitiveness in the instrument employed as an ammeter that it is possible to get good readings with a drop of from 1 volt to 2 volts across the non-inductive resistance inserted in the circuit. As a matter of fact I am arranging my instruments in practice now so that the non-inductive resistance inserted in the circuit shall cause a fall of potential of about $1\frac{1}{2}$ volts as an average, which answers very well for the wattmeter also; this is a handy drop because it approximates to the E.M.F. of a Clark cell which is used for standardizing the instruments, and consequently the readings come near the portion of the scale for which the instruments have been standardized. To attain this object, namely, to always obtain a good deflection on the instrument, a set of non-inductive resistances formed of strips of manganin are used. These strips in practice are about a meter long, and a handy way to arrange them is by beginning with a wire or strip to carry, say, one ampere, to make the next strip carry about two amperes, and the third four amperes, so that about ten strips will usually cover the full range of currents which are likely to be required in practice. For special purposes, of course, higher or lower resistances can be made, and since the instruments take infinitesimal currents, the same set of instruments will measure currents varying from say, $\frac{1}{1000}$th of an ampere to 1,000 amperes or more, with equal percentage of accuracy in each direction if required; consequently the instruments are practically universal in this respect. By arranging these resistances so that they can be placed in parallel, the same deflection approximately on the instruments may, if desired, always be worked to.

As regards the measurement of currents of high voltages, there are two ways of proceeding. The instruments themselves can be made so that they can be directly connected to the high voltage circuit, but I usually prefer to employ instruments standardized for working direct on circuits of from 100 volts to 200 volts as a standard; and for higher voltages, to connect a high non-inductive resistance across the circuit, making the instrument connections across some known fraction of this over which there is a fall of 100 volts or 200 volts.

It now remains to describe this method and the design of the apparatus and instruments, and to show how they are used and applied to the purpose in view. Fig. 1 is a diagram showing the method of connecting the instruments in practice to a circuit on which measurements are to be made, and the figure also shows diagrammatically the method of standardizing the instruments and the switching arrangements by which the different connections are made; this is done by merely turn-

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ing certain handles after the instruments are once set up.

In the diagram, A indicates the alternating current generating machine having a main circuit A_1, wherein is placed a non-inductive resistance *ab*, as mentioned above. From the point *a* a connection is shown to an omnibus bar or common terminal bar B to which most of the circuits hereinafter mentioned are joined. These are best arranged in the following order: C is a standard Clark cell, D is a battery of sufficient power to give rather more than the maximum voltage required for standardizing the instruments. I find a battery of small accumulators very convenient for this purpose, but if such a battery is not accessible the instruments can be standardized by making use of an electric lighting circuit instead, provided that readings are taken at similar pressures, which can be observed by connecting the electric light circuit to the voltmeter while readings on the wattmeter are being taken X is a variable resistance in series with the battery. E is a box of resistance coils so arranged that a resistance of 100,000 ohms is always maintained between the terminals, but by means of

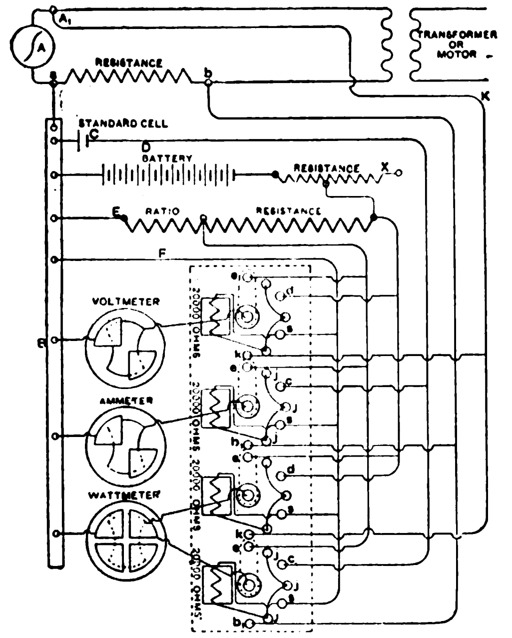

FIG. 1.

movable switches a third connection can be made to the resistance at any point desired. The outside terminals of this, which I call the "ratio" resistance, are connected to the common bar and to the resistance X, so that the ratio resistance forms a shunt across the battery and the resistance X. Let us suppose that the E.M.F. of the battery is 105 volts. By altering the resistance X suitably we can so arrange matters so that there is exactly 100 volts pressure between the outside terminals of the ratio resistance E, under which circumstances we can, by setting the switches of the ratio resistance to the proper points, obtain any voltage we like accurately between 0 and 100 volts. F is a short-circuit connection between the bar B and a terminal *s* in each of the switches indicated below whereby any of the instruments may be short circuited and their zeros adjusted. The electrostatic voltmeter, ammeter, and wattmeter are also connected to this bar. The voltmeter switch has our terminals, *e*, *d*, *s*, and *k*, the terminal *s* short-circuiting the instrument as above stated With the switch in contact with the terminal *d*, the instrument is connected to the battery D, and, similarly when in contact with the terminal *e*, the switch puts the instrument in connection with the ratio resistance E, so that a desired part or ratio of the whole resistance can be measured off and any required voltage within the limit of the battery put upon the needle of the voltmeter, its quadrant plates being connected to the bar B. By this means the voltmeter can be calibrated throughout the whole length of its scale. The termi-

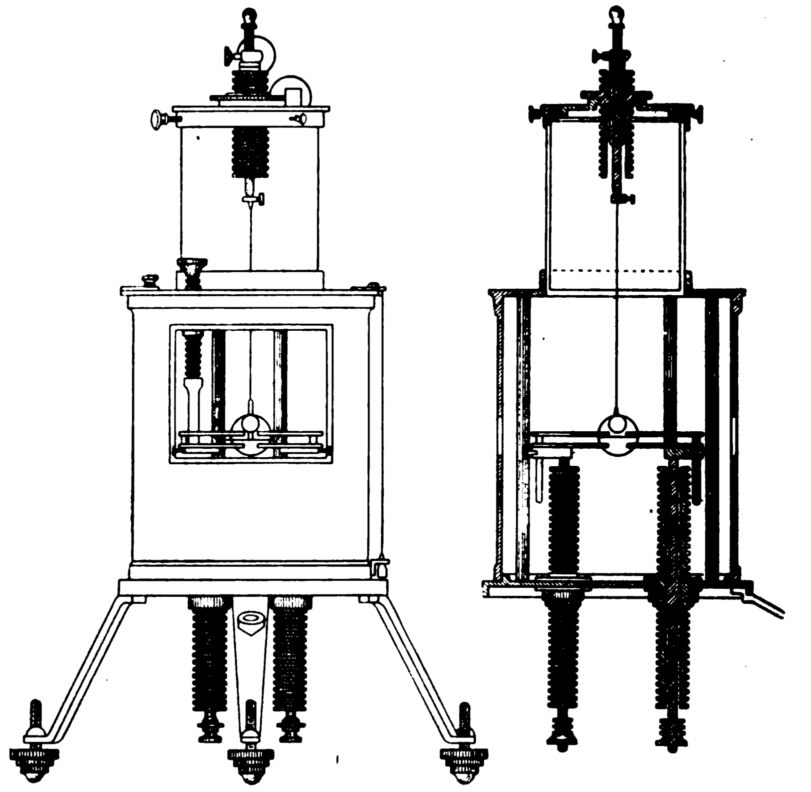

FIG. 2.

nal *k* serves to place the needle in connection with the circuit K, on which measurements are to be made.

The ammeter switch is provided with four similar terminals, indicated by the reference letters *e*, *c*, *s*, and b_1. The terminal is for connecting the needle with the standard cell C. The terminals *e* and *s* correspond to the similar terminals of the voltmeter switch, and the remaining terminal, b_1, connects the ammeter to the main circuit A_1, at the *b* end of the measured non-inductive resistance *ab*. The wattmeter has a double set of switch terminals, one set, *e*, *d*, *s*, k, being exactly the same and with the same circuit connections as for the voltmeter, and the other set, *e*, *c*, *s*, b_1, being similar to those of the ammeter switch.

In changing the instruments from one set of connections over to the other, it is very desirable to have a means of separately short circuiting each of the instruments through a high-resistance of about 20,000 ohms while the operation is performed, otherwise the quadrants must be left unconnected for a period of time, which sometimes leads to violent deflections of the needles when connected to alternating currents and from charges on the ebonite on other adjacent surfaces otherwise difficult to avoid. This is provided for by the intermediate contacts *jj*, in each of the switches, as shown in the figure, which are connected to bobbins containing a resistance of about 20,000 ohms, one for each set of switch contacts.

We now come to the instruments themselves. They are electrostatic, and are all built on the same general lines, which can best be seen by referring to Fig. 2, which represents the wattmeter. It may be noted that this one instrument will perform also the functions of a voltmeter and of an ammeter or low-reading voltmeter by simply altering the suspension of the needle and appropriately adjusting the quadrents. The instrument as shown is provided with very high insulation, so that it can be used for measuring high resistances, capacities, etc., but such insulation is not specially necessary where the instrument is to be used for measuring currents only, or as a low-pressure voltmeter.

The suspension consists usually of a flat phosphor bronze strip of the kind which was brought into use by Messrs. Ayrton and Perry, and which is so largely used in connection with the d'Arsonval galvanometer. This, of course, forms an excellent connection to the needle, so that there is no necessity to use sulphuric acid. Further, by using a specially light needle, I find that I can get sufficient decrement without any other form of damping, and consequently the needle may hang perfectly free in air, and there is nothing which can interfere with its proper movement in any way. It will be noticed that the quadrants are not made in the form of a box, as is usually the case, but consist of two sets of flat plates, the one set of which, usually the upper, is adjustable and can even be taken off altogether if required. This simple improvement, while it does not interfere with the action of the instrument in any way, greatly increases its range, adjustability and portability: in fact it is much like adding a universal shunt to a galvanometer. The needle, it will be noticed, can be moved up and down by means of a rack motion, and can thus be set in the center of the quadrants whatever the action of the upper and lower plates. For high voltages the upper plates can be removed altogether, and the needle removed some distance from the lower set of quadrants. On the other hand, the needle may be brought down close to the bottom set of quadrants and the top set brought down until the space between is not more than a millimeter. Under these conditions a deflec-

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tion of 50 mm. to 100 mm., with the scale at a distance of 2 meters, can be obtained with the most sensitive strip with a pressure of 1 volt only when the instrument is connected up idiostatically, or as a simple voltmeter, and it is in this sensitive form that the instrument can be used as an ammeter by coupling it across a resistance in which from 1 volt to 2 volts is lost, as mentioned above. If we take this ammeter as our basis instrument, then the wattmeter to go with it must have a thicker suspension and be used with the quadrants further apart; in fact, it should be about $\frac{1}{10}$th of the sensitiveness of the ammeter. Then, again, the voltmeter requires to be much less sensitive still, this reduction in sensitiveness being obtained by the use of only one set of quadrants, and a much thicker and shorter strip, and in the latter case, owing to the strength of the torque, it is best to reduce the period by damping with oil. In each of the instruments, by taking off one or more of the top quadrants, and unscrewing the centering screws of the head, the head can be lifted off, carrying with it the needle, which can thus easily be changed. For carriage it is merely necessary to let down the needle on the bottom quadrants, and let down the top quadrants on the needle, which firmly clamp it, so that the instrument can be shaken or turned upside down without any damage resulting. Owing to the fact that the needles are flat and very light they are exceedingly little affected by vibration, so that the instruments can be used on upper floors and near moving machinery. In use it is well to put in the circuit of each needle a 250-volt lamp of 5 cp. I find this better than any form of fuse, as the current which can then pass through the instrument is too small to hurt the strip or needle, and at the same time instant warning is given by the lighting of the lamp if by any chance the needle should get attracted to the quadrants. The instruments are reflecting, and I usually arrange the scales at a distance of about 2 meters from the instruments.

With the help of the standardizing arrangements, approximate deflections are taken on them for the scale readings they are intended to give with given voltages on the needles and quadrants. The requisite sensitiveness is then obtained approximately by varying the distance between the upper and lower quadrants in two of the instruments, and the distance of the needle from the quadrants in the voltmeter till very nearly the deflections required are obtained. The scales themselves are on sliding supports, and the final adjustment is made by sliding the scales nearer to or further from the instruments until the given voltages produce deflections of the right length on the scales. In this way the instruments can be made to read watts, volts and amperes directly.

To standardize the wattmeter the needle switch is turned to the battery connection *d*, and the quadrant switch to the Clark cell connection *c*, the ratio resistance being set to 1,140 (supposing the resistance is 100,000 ohms as a total, and that the voltage across the ends of it is 100 volts). The quadrant switch is then turned so that the quadrants are connected to the positive end of this ratio instead of to the positive of the Clark cell, and the resistance X is adjusted so that whether the electrometer is connected to the Clark cell or to the point of ratio resistance the deflection is the same. It is obvious that under these circumstances the voltage across the outside terminals of the ratio resistance must be 100 volts. Consequently we know the voltage on the needle and the voltage on the quadrants which are the factors requisite for obtaining the constant of the electrometer. If the scale is graduated in millimeters it is now convenient to adjust the instrument and the distance of the scale, so that the reading is 144 millimeters. If this is done, then if the quadrants are connected across a resistance, the value of which is known in ohms or fractions of an ohm inserted in a circuit, and the needle is connected to the other side of the circuit, presuming the voltage does not fall very much below 100 volts, then the instrument will read directly in watts when multiplied by the reciprocal of the resistance, or if the resistances are numbered by their conductivities instead of by their resistances, then we have simply to multiply the reading by the conductivity, so that the instrument becomes a direct-reading wattmeter of almost universal range. Having now got 100 volts exactly across the battery by altering the value of the ratio in the resistance, the calibration of the electrometer throughout its whole scale can be made by simply turning the resistance switches to the appropriate points. If this is done it will be found that the scale is proportionate within half per cent. over a range of about 200 millimeters, and is within 1 per cent. over 300 millimeters. It will be observed that by calibrating under the exact conditions of use we do away with the necessity of applying any formula to the deflections of the instruments.

To calibrate the voltmeter, all we have obviously to do is to put it across the whole of the ratio resistance, since the drop across this is 100 volts exactly. The sensitiveness of the instrument should then be so adjusted by raising the needle or lowering it, and by moving the scale in or out that when the instrument is so connected it deflects to the point marked 100 volts on the scale. The instrument can be calibrated for any lower reading than this throughout the scale by altering the ratio point by the proper amount.

The sensitive electrostatic voltmeter which is used as an ammeter is now calibrated by connecting it directly by means of its proper switch across the poles of the Clark cell or the corresponding points on the ratio resistance, and this instrument also can further be calibrated in the same way throughout its whole scale by using the ratio. Owing to its delicacy and construction, however, the scale of this instrument is not quite so proportionate as in the case of the other two, and therefore it is well to construct a scale for it by setting the ratio resistance at the required points and noting the corresponding deflections. This can be quickly done, and when once the scale is made the instrument can afterwards be adjusted to read to this accurately, as described for the other instruments.

The instruments are now all calibrated, and nothing remains to be done but to turn their switches to the circuit connection, when they will give direct readings on any circuit to which they may be connected, the reading of the voltmeter being, of course, multiplied by the ratio of the high resistance across the circuit (if such is used), the reading of the ammeter being multiplied by the value of the known resistance (its conductivity) in the circuit and the wattmeter reading being multiplied by both these factors.

If the circuit is non-inductive the ammeter and voltmeter readings, when multiplied together, correspond with the wattmeter reading. If the circuit is inductive this, of course will not be the case, and if we divide the watts as shown by the wattmeter by the volts as shown by the voltmeter, then we get the effective amperes flowing in the circuit. On the other hand, the ammeter gives us the total, or as they are sometimes called, the "apparent" amperes flowing in the circuit. The ratio of these two gives us the power factor, from which, by merely consulting a table of sines or cosines, we find at once the angle of lag. If we know the periodicity of the circuit the coefficient of self-induction can be obtained without further observation.

By having a revolving contact connected to a small synchronous motor it is obvious that by the aid of the above instruments it is also easy to take a set of readings from which the actual curve of E.M.F. and current in the circuit can be plotted, with their lag or lead.

Where great accuracy is required in the readings it is obvious that all we have to do is to take a set of readings on any circuit and then turn over the switches one by one on to the ratio resistance, altering this until the deflections of the instruments on the circuit are reproduced. We then can read off directly and without calculation the continuous E.M.F.'s necessary to produce these deflections from which the value of the E.M.F. and the current in the circuit (the resistance across which measurements were made being known) is at once deduced.

It is obvious that the instruments are equally suitable for measuring continuous currents over almost any range, so that the instruments practically form a universal set of measuring instruments, whether for alternating or continuous currents. They can also be used for hysteresis and permeability tests, and for a number of other purposes to which I need not more directly allude.

For multiphase work, when the circuits may be unequally loaded, two sets of resistances may be used and the instruments can be quickly switched from one to the other. Or two sets of instruments may be used. Or instruments, particularly as wattmeters, may be employed with a double set of quadrants and double needle, the top needle being insulated from the lower; which receives its charge through a jar of acid. By means of the adjustable quadrants, it is easy to make both needles deflect equally for equal charges, so that when both are employed to read together their readings are added. For other purposes it is possible to use this double instrument as a zero instrument, and balance a known continuous against an alternating voltage.

The Sprague Electric Company's New Office.

The Sprague Electric Company has recently opened a branch office in the Security Building, St. Louis. Mr. C. B. White, who is well known in the Western electrical field, will have charge of the new office. He was formerly connected with the engineering department of the old Edison Electric Company, was located in Pittsburg, and performed considerable construction work in that territory. He was later electrical superintendent in charge of construction work with the Calumet Electric Street Railway Company, Chicago, and for the past two years has been connected with the Western Electric Company in the engineering and sales department. The Sprague Electric Company now has branch offices in Chicago, Boston and St. Louis, and agencies in all of the principal cities in this country and abroad.

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SOCIETY NEWS.

American Institute of Electrical Engineers.

The 147th meeting will be held at 12 West 31st street, New York, Wednesday, October 24, at 8:15 P. M. The President will deliver his inaugural address on "The Paris Exposition of 1900." If time permits, some views of the exhibition will be shown by means of lantern slides. Mr. Frank W. Roller will also exhibit and explain the "Column Type of Indicating and Recording Volt and Ampere Meters."

Applications have been received from the following candidates for associate membership, which will be acted upon by the Council at its meeting, November 23, 1900: George Henry Sethman, Denver, Col.; Leon Byron Woodworth, Johannesburg, S. A. R.; George Alexander Walkhem, Vancouver, B. C.; C. M. Lowther, Ira R. Henry, New York; George Hafer, Jr., Cincinnati, O.; George Porter Baldwin, San Francisco, Cal.; Edward Andrew Deeds, Dayton, O.; Warren J. Ballou, Woonsocket, R. I.; Henry R. Leyden, Hamilton, Can,: Mikail de Chatelain, St. Petersburg, Russia; Frank, W. Springer, James Cezanne Kelsey, Minneapolis, Minn.; V. G. Converse, Pittsburg, Pa.

At the last meeting of the Executive Committee it was voted that hereafter the monthly meetings of the Institute be held on the fourth Friday of each month, instead of the fourth Wednesday as heretofore. This arrangement will go into effect in November, therefore the next meeting will be held on Friday, November 23, 1900.

The New York Electrical Society.

The 208th meeting of the Society will be held at the College of the City of New York, 23d street and Lexington Avenue, on Tuesday, October 30, at 8 P. M. The evening will be devoted to a symposium on the Paris Exposition and the Paris Electrical Congress. The subject will be profusely illustrated by lantern slides. Addresses on its various branches are expected from President Hering, of the American Institute of Electrical Engineers: Dr. A. E. Kennelly; Prof. F. B. Crocker; Mr. G. O. Mailloux; Mr. T. C. Martin and others who have visited the Exposition and participated in its Congress. Ladies' night.

Exports of Electrical Material from New York.

The following are the exports of electrical material and machinery, from the port of New York, for the week ended October 18:

Antwerp, 18 cases, $1,638; Argentine Republic, 519 packages, $15,953, 50 cases, $4,089; 13 cases electric meters, $1,000; 16 cases electric motors, $2,457; Australia, 5 cases, $809; Birkenhead, 16 packages motor trucks, $2,332; Brazil, 61 packages, $1,436; 8 cases, $7,814; Bristol, 7 packages, $426; British West Indies, 24 cases, $747; British East Indies, 13 cases, $1,460; Catania, 121 cases, $14,976. Central America, 40 cases, $732; China, 82 packages, $2,736; Cuba, 75 packages, $672; Dutch East Indies, 20 cases, $399; Ecuador, 68 packages, $2,497; 5 cases, $152; Florence, 1 case, $14; Genoa, 52 cases, $2,548; Glasgow, 72 packages, $18,325; 25 cases, $4,161; 40 packages, electric cable, $8,852; 15 packages trolley poles, $685; Hamburg, 68 packages, $5,526; Havre, 50 packages, $2,813; 1 case automobiles, $302; Japan, 64 cases, $14,227; Korea, 8 packages, $107; London, 239 packages, $14,669; 18 cases automobiles, $4,000, Liverpool, 63 packages, $14,691, 11 packages trolley material, $922; Mexico, 908 cases, $10,842, 50 packages automobiles, $16,991; Naples, 114 cases, $12,447; Newcastle, 231 packages, $41,400; Peru, 35 cases, $1,299; Porto Rico, 60 packages, $690; Riga, 19 cases, $3,918; Rostoff, 118 cases, $23,573; Southampton, 6 packages, $2,920; 7 cases, $880; Siam, 13 cases, $2,158; Trieste, 1 case, $140, U. S. Colombia, 131 cases, $1,830; Venezuela, 2 cases, $59.

PERSONAL MENTION.

Mr. Charles G. Wingate, formerly superintendent of the Huntington (N. Y.) Electric Railroad, has been appointed superintendent of the Ridgewood division of the Brooklyn Elevated Railroad system.

Mr. M. M. Dolphin of Kansas City, Mo., has been elected president of the Order of Railway Telegraphers.

Mr. Frank F. Healy has been engaged by the American Stoker Company of Erie, Pa., to go to Montreal, Can., and supervise the installation of eight large steam boilers and an engine of 1,500 horse-power for the Montreal Electric Lighting Company.

Mr. W. A. Coler has been reappointed superintendent of the Afton, N.Y., Central Telephone Station for another year.

INCORPORATIONS.

The Petersen & de Hosson Manufacturing Company, Chicago, Ill.—to manufacture electrical appliances. Capital stock, $25,000. Incorporators: H. Petersen, B. F. de Hosson and Morse Ives.

The Hannibal Railway & Electric Company, Hannibal, Mo. Capital stock, $100,000. Incorporators: E. Douglass Brewington, George D. Clayton, Edward P. Bowman and others.

The Economy Steam Heating & Electric Company, Sedalia, Mo. Capital stock, $50,000. Incorporators: Isaac H. Babcock, Charles R. Bishop, William D. Hall and others.

The Incandescent Mantel Company, St. Louis. Mo. Capital stock, $10,000.

The Mutual Traction & Illuminating Company, Somerville, N. J.—to manufacture electricity. Capital stock, $100,000. Incorporators: Jose Eugenio Marx, Max Marx and Alvah A. Clark.

The Electric Chemical Reduction Company, East St. Louis, Ill.—to reduce ores and other minerals. Capital stock, $3,500. Incorporators: J. W. Gannon, E. L. Anderson and J. E. Chambers, all of East St. Louis.

The Keystone Electric Light, Heat & Power Company, Maxatawney, Pa. Capital stock, $15,000.

ELECTRICAL PATENT RECORD.

[This department is edited by OSCAR A. MICHEL, Solicitor and Attorney for AMERICAN AND FOREIGN PATENTS, at 302 and 304 Broadway (Room 1204), New York City, also at 639 F street, N. W., Washington, D. C., who has been identified with this work before the U. S. Patent Office for more than fifteen years. Any inquiries upon the above subject as well as printed publications containing all information regarding the cost of United States and Foreign Patents, Trade Marks, Designs, etc., will be given free upon application by addressing OSCAR A. MICHEL, Nos. 302-304 Broadway, New York City, N. Y., or 639 F street, N.W., Washington, D. C. Copies of any patent published can be furnished upon payment of ten cents. When ordering give name, date and title of invention wanted.]

LETTERS PATENT ISSUED OCTOBER 16, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

659,694. High-Potential Trolley System. William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 11, 1898.

659,823. Suspending Device for Trolley-Wires. William A. McCallum, Cincinnati, O. Filed Feb. 5, 1900.

659,982. Car-Fender. Joseph W. McKean, Charleroi, Pa. Filed Feb. 26, 1900.

660,065. Traction System. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Filed April 30, 1898.

ELECTRIC LIGHTS AND APPLIANCES.

659,658. Electric-Arc Lamp. Richard Fleming, Lynn, Mass., assignor to the General Electric Company of New York. Filed April 4, 1898.

659,687. Electric Incandescent Lamp. Frederick Myers, New York City, assignor to Albert W. W. Miller, South Orange, N. J. Filed Sept. 26, 1899.

659,702. Means for Suspending Incandescent Electric Lights. Theodore Smith, Georgetown, Ill. Filed Feb. 26, 1900.

659,705. Clutch for Electric-Arc Lamps. Henry C. Spinney, Lynn, Mass., assignor to the General Electric Company of New York. Filed April 4, 1898.

659,706. Globe-Holder. Henry C. Spinney, Lynn, Mass., assignor to the General Electric Company of New York. Filed March 23, 1899.

659,710-659,711. Electric-Arc Lamp. George E. Stevens, Lynn, Mass., assignor to the General Electric Company of New York. Filed Nov. 14, 1898, May 31, 1889.

659,717. Contact Device. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed May 6, 1899.

660,047. Electric-Lighting System. Joseph I. Conklin, New York City. Filed March 28, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

659,660. Apparatus for Periodical Generation of Electric Currents by Motors of Irregular Driving Power. Max Gehre, Rath, Germany. Filed Dec. 19, 1899.

659,829. Dynamo-Electric Machine. Willard F. Richards Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed Jan. 2, 1900.

659,873. Snap-Switch Commutator. Charles G. Perkins, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, same place. Filed June 28, 1900.

659,946. Electric Switch. George H. Whittingham, Baltimore, Md. Filed Feb. 5, 1900.

660,054. Controlling-Brake for Motors. Arthur C. Eastwood, Ensley, Ala., assignor to the Electric Controller & Supply Company, Cleveland, O. Filed May 14, 1900.

660,057. Astatic Armature for Electric-Supply Meters. Sydney Evershed, London, Eng., assignor to himself and the Evershed & Vignoles, Limited, same place. Filed July 21, 1900.

660,066. Method of Regulating Motors. Frank J. Sprague, New York City, assignor to the Sprague Electric Company of New Jersey. Original application filed April 30, 1898. Divided and this application filed June 23, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

659,691. Telephone-Transmitter. George B. Perkins, Medford, Mass. Filed Jan. 16, 1900.

659,759. Telephone-Exchange System. James L. McQuarrie, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 10, 1898.

659,768. Pilot-Signal for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed March 11, 1897.

659,789. Signal for Telephone Trunk-Lines. Henry M. Crane, New York City, assignor to the Western Electric Company, Chicago, Ill. Filed Jan. 10, 1900.

659,940. Telephone-Switch. Alfred Stromberg, Chicago, Ill. Filed June 13, 1900.

659,958. Telephone-System. William M. Davis, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, same place. Filed June 28, 1900.

659,959. Telephone-Exchange System. William M. Davis, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, same place. Filed June 28, 1900.

MISCELLANEOUS.

659,655. Apparatus for the Electrolytic Decomposition of Alkaline Salts, Edwin Edser, London, Eng. Filed March 31, 1899.

659,661. Coin-Controlled Mechanism for Phonographs, etc. George W. Gomber, Conyngham, Pa., assignor, by mesne assignments, to the American Multiplex Talking Machine Company of West Virginia. Filed March 18, 1899.

659,664. System of Electrical Distribution. Charles M. Green and John G. Callan, Lynn, Mass., assignors to the General Electric Company of New York. Filed June 30, 1900.

659,671. Magnetic Blow-Out or Fuse-Box. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed April 21, 1900.

659,697. Power-Transmitting Mechanism. Charles W. Richards and Winthrop M. Chapman, Needham, Mass. Filed Aug. 17, 1899.

659,716. Adjusting Reluctance of Magnetic Circuits. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed July 20, 1898.

659,725. Electric Time-Alarm, Simon Wolf, Essen, Germany. Filed Feb. 7, 1900.

659,729. Control Apparatus for Electric Carriages. Howard F. Eaton, Quincy, Mass. Filed March 25, 1899.

659,734-659,735-659,739. Phonograph. George W. Gomber, Conyngham, Pa., assignor, by mesne assignments, to the American Multiplex Talking Machine Company of West Virginia. Filed July 13, 1896, Aug. 18, 1896, April 8, 1897.

659,760. High-Frequency Transformer. Charles P. L. Noxon, Syracuse, N. Y. Filed Feb. 20, 1899.

659,766. Automatic Electric Cut Out. John H. Robertson, Morrison, Ill. Filed June 22, 1899.

659,793. Electric Alarm System and Testing Apparatus Leonard H. Des Isles, Cambridge, Mass., assignor to Roscoe F. Hersey, St. Paul, Minn. Filed Jan. 10, 1900.

659,824. Circuit-Controller for Electrical Mechanism. William A. McCallum, Cincinnati, O. Filed April 17, 1900.

659,828. System of Electrical Distribution. Edwin W. Rice, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 16, 1899.

659,882. Spool for Electromagnets. George L. Weaver, Boston, Mass., assignor to Horace E. Harriman, Georgetown, Mass. Filed April 30, 1900.

659,891. Adjusting Device for Vacuum-Tubes. Thomas B. Kinraide, Boston, Mass. Filed Dec. 26, 1899.

660,021. Electricity Meter. William M. Mordey and Guy C. Fricker, London, Eng. Filed May 19, 1900.

660,043. Electrical Furnace. Wilhelm Borchers, Aachen, Germany. Filed Dec. 22, 1898.

660,045. Electrically-Actuated Sawmill Set-Works. William M. Carroll, Beaumont, Tex. Filed May 12, 1900.

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THE TELEPHONE WORLD.

A Michigan Company Will Extend its Lines.

Manager Owen of the Allegan Telephone Company is making plans to extend his line from Allegan to Otsego and Plainwell. When the Michigan Telephone Company assumed the telephone property at Kalamazoo it also took charge of the exchange at Otsego and at Plainwell, and at once began to replace the independent 'phones by its own system as fast as possible, thus cutting off the connection which the Allegan Telephone Company formerly had at Otsego. Mr. Owen will remedy this by building a line of his own. He has also planned to build a line from Allegan to Gobleville and there connect with the Kibbie Telephone Company, which has several hundred 'phones in Van Buren County and taps every little town in that vicinity. The Allegan Company now has connection with the Citizens' Company of Grand Rapids, and the proposed line will connect all of the little towns in the vicinity with that city, and will give the Citizens' Company another line connecting with the Kibbie Company on the lake shore.

Last week Attorney John A. Delehanty secured from Justice Chase a writ of certiorari directed to the New York State board of tax commissioners, ordering them to review the assessments placed on the special franchise of the Hudson River Telephone Company in the Albany district. The writ was granted on the usual grounds that the assessment is unconstitutional and excessive, and on the further ground that it makes the company pay extra for its franchise. The company claims that it has laid free conduits and cables for the city of Albany, amounting in value to $3,000.

The Marathon County Telephone Company of Wisconsin has its line extended as far as Mosinee. It will touch Scofield, Marathon City, Rib Falls, Athens, Edgar, Fenwood, Stratford, McMillan and Marshfield. It will connect with the Citizens' line extending between Wausau and Marshfield. The new company has between 700 and 800 subscribers. The line will be completed by November 1.

The St. John's Valley Telephone Company has been organized at Van Buren, Me., with $2,000 capital for the purpose of operating a telephone line from the boundary line between Maine and New Brunswick, through Madawaska, Grand Isle, Van Buren, Hamlin Plantation, Grand Falls, N.B., Cyr Plantation, Connor Plantation, Caribou, and connect with any system at the terminal points. The officers are: President, Peter C. Keegan, of Van Buren; treasurer, T. J. Crocker, of Edmundston, N. B.

The parties to whom a franchise to put in an independent telephone system in Corsicana, Tex., was granted have secured a building for an exchange and announce that work on the line will begin shortly. The franchise was granted to F. B. McElroy and others, but it is understood the work will be inaugurated by Emory & Smith of San Antonio, Tex.

A new telephone company is to be organized in Elma, Wash., and it is expected that before long a line will be established giving direct communication between Centralia and Hoquiam, taking in Aberdeen, Montesano, Satsop, Elma, Porter, Oakville and Gate City, connecting with all the booms, lumber camps and saw and shingle mills. The promoter of the proposed line and company is O. H. Pearson of Elma.

President James E. Caldwell and Manager Leland Hume of the Cumberland Telephone Company, successors of the East Tennessee Company, recently inspected the Bristol, Tenn., exchange. They expressed themselves well pleased with the prospects in Bristol, and spoke of the probability of building branch lines from that place.

One of the recent important matters decided by the board of mayor and aldermen of Woodlawn, Ala., was the granting of a franchise to the Southern Bell Telephone & Telegraph Company.

The Eugene, Ore., telephone exchange will have a new switchboard next month. A new line is being extended to Jasper, Thurston and Waterville, Ore., and may be carried on to the Blue River mines.

The Delaware and Atlantic Telegraph & Telephone Company has lately been improving its lines in Wilmington, Del. An extension is being made to Edgemoor, where several instruments will be installed.

The Northwestern Telephone Exchange Company reports a net gain of 519 subscribers in September, making a total number of 20,686 subscribers on September 30.

The telephone exchange in Le Roy, N. Y., is constantly growing.

Duplex Telephony.

Mr. E. A. Martin, Inspector of the Central Union Telephone Company at Davenport, Ia., has been experimenting for about a month upon the problem of duplex telephony, the successful solution of which means a million dollars to the inventor, according to a standing offer made by a large electric concern of Chicago. It has been generally conceded to be within the range of legitimate endeavor being akin to duplex telegraphy, but has so far baffled those who have given it any thought, and it was to stimulate interest in a feature of high scientific value, that a large reward was offered. Mr. Martin claims to have found a solution to the problem. He does not, however, propose to give a description of his mode of operation until after a caveat for a patent has been filed.

The addition of nearly a thousand miles of new territory and the bringing of New Orleans, La., into direct telephone communication with between 300 and 400 towns in East Kentucky and Tennessee, will shortly be an accomplished fact. This important extension of long distance telephone service out of New Orleans is the outcome of the recent purchase by the Cumberland Telephone and Telegraph Company of the line of the East Tennessee Telephone Company. The latter company operated over 900 miles of wires in sections of Eastern Kentucky and Tennessee not traversed by the Cumberland Company. The company had nearly 400 offices established in these two States, including two large exchanges at Chattanooga and Knoxville, Tenn., and one at Paducah, Ky. As a result of the purchase all these offices will be connected up with the Cumberland Company's lines, thereby greatly extending the long distance service and giving to the latter company a much larger field for operations, particularly in the two States mentioned.

Plans have been started in Charleston, S. C., by the Gordon Telephone Company to give long-distance connections out of that city. The plan by which this will be done has not been announced, as it is said the Gordon people are not prepared to let the public into their confidence just at this time, although arrangements are well under way. Messrs. Cecil G. Fennell and Reginald F. Fennell, secretary and general manager of the company, will begin at once to complete their arrangements by which the long distance service can be established. While this work is being done the company will increase the capacity of its local system, and make additions and improvements to meet the extra amount of business which will come about when the out of town lines have been opened.

The Spring Telephone Company, whose lines extend through the western part of Snyder County, Pa., has sold its lines, instruments and effects to the Penn Telephone Company for $12,800. This purchase is the beginning of a large deal. The next move will be the consolidation of the Penn, Tuscarora, Home, Shamokin Valley, Schuylkill and Montour and Columbia Telephone Companies.

The city of Glasgow, Scotland, has a population of 600,000. It is asserted that telephone service in a large city costs the operating company more than in the smaller cities. Glasgow, it is claimed, has a thoroughly efficient system that costs subscribers $25.25 a year.

The Sparta, Mich., Telephone Company was lately reorganized. Charles H. Loomis is president. Dr. D. J. Wallace, J. Hisey and August Johnson form the executive committee. Bruce N. Keister is secretary and treasurer. The company will get a one hundred drop switchboard and affiliate with the Citizens' Telephone Company of Grand Rapids.

It is said on good authority that A. R. Warner of Cleveland, O., acting for the United States Telephone Company of Cleveland, has purchased the franchise of the Citizens' Telephone Company of Mansfield, O. The Citizens' Company has never done anything further than to take subscriptions for telephone service.

Chicago so far, it is claimed, is the only place where a school has been established for the systematic teaching of the telephone operator, who can receive there a training in all that would make her the expert that practice finally does.

The Erie Telegraph & Telephone Company, which will run lines between Troy N. Y., and Cleveland, O., has filed an amended certificate of incorporation with the Secretary of State. The capital of the company is $15,000,000.

The St. Croix Telephone Company has placed a new wire on its line in Osceola, Wis., for the exclusive use of business men.

The Northern Illinois Telephone Company of Sandwich, Ill., has increased its capital stock from $30,000 to $250,000.

An informal meeting of the board of aldermen of Gardiner, Me., was held a short time ago, and they were practically unanimous in favor of admitting the Eastern Telephone Company. About a year ago the Eastern Telephone Company petitioned for the right to place its poles in that city and was rigorously opposed by the new England Telephone & Telegraph Company, the aldermen at the time being a tie. Since then the sentiment of the community has been found to be practically unanimous in favor of the admission of the company.

A move was made recently at Cincinnati, O., at the meeting of the Board of Legislation, when Mr. Mullen introduced an ordinance to grant to the Kleine Electrical Engineering Company a franchise to engage in the telephone, telegraph, fire-alarm, burglar-alarm and messenger business in that city for twenty-five years. Mr. Mullen would vouchsafe no information regarding this move further than that he meant business, and that the ordinance would speak for itself.

Manager Atwood of the local system of the Northwestern Telephone Company of Jamestown, N. D., will shortly establish long distance stations at Rogers, Hannaford, Dazey and Cooperstown, N. D. The wires have been strung from Sanborn to Cooperstown, and all that is now necessary is to complete the connections. The line will not be extended beyond Cooperstown this season.

The Sunset Telephone Company, which recently began construction of a building for local headquarters at Tacoma, Wash., has suspended work until authority can be secured from the city to bury its wires. A new ordinance is being framed which will give the company power to lay wires in conduits.

C. H. Fisher, manager of the telephone exchange at Granbury, Tex., writes us that there is need of a telephone expert in that vicinity as many telephones and switchboards are out of order. He adds that a good price would willingly be paid for the services of a good man.

The Nichols Law State Tax Board has completed valuation of the City and Suburban Telephone & Telegraph Association of Cincinnati, O., appraising it on a basis of its capital stock and earnings at $743,179, an increase of $7,141 over last year.

The Rawson Electric Company of Elyria, O., known as the Home Telephone Company, which was granted a franchise by the Lockport, N. Y., common council last spring, began work a short time ago on the construction of a new telephone exchange.

The telephone line between Monroe and Dusty, Ore., is now completed. The force employed in its construction has gone to Brownsville, where another line is to be put up, connecting that town with Sweet Home, Ore.

The Peoria & Eastern Automatic Telephone Company of Chatsworth, Ill., recently changed its name to the Peoria & Eastern Telephone Company. The capital stock was increased from $12,000 to $25,000.

Guy M. Gest has been awarded the contract for building the subways for the complete telephone conduit system at Racine, Wis. The system will be about six miles long.

TELEPHONE INCORPORATIONS.

The West Canada Telephone Company, Vernon, N. Y.—to operate telephone lines between villages in Herkimer and Hamilton Counties. Capital stock, $3,000. Directors: J. W. Jenkins and J. E. Jenkins, of Vernon, and S. E. Harvey, of Grant.

The Roachdale Union Telephone Company, Roachdale, Ind. Capital stock, $100,000. Incorporators: Benjamin B. Cline, Charles A. Edwards, Isaac E. Weddel, Joseph Cline, W. Turpie, Robert Britton, M. L. Pope, A. G. Cook, E. O. Coffman and A. C. Lockridge.

The Andover Electric Telephone Company, Andover, O. Capital stock, $6,000. Incorporators: C. E. Harmon, S. R. Wood, W. Grubham, V. M. Cole and W. Webb.

The Paris and Minter Telephone Company, Pattonville, Tex.—to operate a telephone line from Pattonville to Paris, Minter and other points in the counties of Lamar, Delta and Red River. Capital stock, $2,500.

The Central Energy Telephone Company, Frankfort, Ind. Capital stock, $30,000. Directors: John H. Murphy, Murat W. Hopkins and William Pogue, all of Indianapolis.

The Johnson County Mutual Telephone Company, Sharon Center, Ia.—to do a general telephone business. Capital stock, $1,000. Incorporators: G. W. Wagner, J. P. Memler, L. G. Shaver and T. N. Wagner, all of Sharon Center.

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GENERAL NEWS.

What is Going On in the Electrical World.

LIGHTING.

Arkansas City, Ark.—F. D. Hagar and J. F. Small of St. Louis, Mo., are organizing a stock company to build waterworks, an electric light plant, etc.

Avon, N. Y.—The electric light company of this place has agreed to furnish light for the streets upon the rate of the old contract until June next, after which time there is to be an extra charge of $2 per lamp.

Beaver Falls, Pa.—At a meeting of the citizens of College Hill it was decided to have the people vote upon the question of building their own electric light plant. An estimate of $13,000 was reported and the decision arrived at was unanimous.

Bloomington, Ill.—The Chicago & Alton Railroad will erect a power house and an electric light plant; engines, boilers, dynamos, etc., will be required.

Chicago, Ill.—The city council has declared for the municipal ownership of all gas and electric light plants. A law to that effect will be drafted for submission to the next General Assembly.

Corsicana, Tex.—Mayor S. W. Johnson in his message to the council recommends the building of an electric light plant by the city.

Des Moines, Ia.—R. H. MacMullan, manager of the Edison Light Company, recently said that the company will shortly begin the work of putting its wires under ground.

Florence, Ala.—E. J. O'Beirne has been granted a franchise by the council to build an electric light plant here. Arrangements have also been perfected to light Sheffield and Tuscumbia from the same plant. The power plant will be built on the Tennessee River.

Grundy Centre, Ia.—The electric light plant here was recently destroyed by fire.

Hutchinson, Minn.—W. E. Harrington, E. Drew, H. H. Ames and others have formed a company with a capital of $25,000 and will at once receive plans and specifications for an electric light plant.

La Crosse, Wis.—This city is discussing the question of erecting a municipal electric lighting plant.

Lexington, Ky.—The Lexington Railway Company will make improvements to its power house, including the installation of an incandescent engine with a capacity of 3,000 lights. Mr. Hathaway, general manager, can be addressed.

Little Falls, Minn.—The Little Falls Electric Light Company will purchase a new incandescent light machine to replace the one damaged recently.

Marblehead, Mass.—The city council intends to enlarge the present electric light plant at a cost of about $10,000.

Millen, Ga.—The town council lately granted to the Millen Cotton Mills a franchise to use the streets for electric light poles.

Montesano, Wash.—A franchise has been granted to Chester H. Kiehl and others for an electric light and power plant, the franchise lasting for fifty years. The work must begin within six months.

Mora, Minn.—The plant of the Mora Milling & Electric Light Company burned a short time ago. Loss, $12,000; insurance, $7,000.

Mt. Gilead, O.—The voters of this city have decided in favor of an electric light plant. J. C. Fish of Shelby was granted a franchise.

Mt. Morris, Ill.—E. F. Thomas has secured a franchise for installing an electric light plant here.

Mt. Vernon, Ill.—This place has floated 4 per cent. bonds for $98,500 to be used to purchase water and electric light plants.

Neoga, Ill.—The contract has been awarded by the city council for the erection of an electric light plant.

New Springfield, O.—H. O. Brown is contemplating the erection of an electric light plant to furnish light for his store and other business places and residences in this town.

North New Portland, Me.—C. H. Bartlett will shortly erect an electric light plant at this place.

Orlando, Fla.—The city council has advertised for a proposition to light the city by electricity.

Pekin, Ill.—The citizens of this place are discussing the question of erecting a municipal electric light plant.

Penn's Grove, N. J.—An electric light plant will soon be built here.

Rosebud, Tex.—W. H. Freeman of this place is authority for the statement that the Southern Electric Light Company will erect an electric light plant to operate about 25 1,000 cp. arc and 2,000 16 cp. incandescent lights.

Springfield, Ill.—A new light plant costing $20,000 will be put in the State Capitol Building.

Tampa, Fla.—At a council meeting held a short time ago W. H. Frecker moved that the city attorney be instructed to prepare an ordinance to provide for a bonding election on the water and electric light questions. The motion was unanimously adopted.

Tennille, Ga.—A franchise for furnishing this place with electric lights has been given the cotton factory people, and they will put in a plant at once. The plant will be of sufficient power to furnish Sandersville, a city some three miles distant, with lights also.

Tionesta, Pa.—D. W. Clark, village secretary, is preparing estimates for an electric light plant to be erected here.

Tiptonville, Tenn.—F. W. Luscombe is the promoter of the electric light plant now being agitated in this place.

Towner, N. D.—F. M. Dompier will in the near future install an electric light plant in his new block just completed in this city.

Weiser, Idaho.—The city clerk was lately instructed to advertise the sale of $45,000 bonds for the purpose of building an electric light plant.

Woodstock, Ont.—The ratepayers of this place will vote on a $30,000 by-law for electric light, $14,000 to purchase the electric company's plant and $16,000 to renew and extend it.

York, Pa.—The Merchants' Electric Light, Heat & Power Company has been formed with $750,000 capital stock and an electric plant will soon be built. Charles H. Bear is at the head of the movement.

STREET RAILWAYS.

Chicago, Ill.—The trolley car and the overhead wire have replaced the storage battery cars of the Chicago Electric Traction Company between Morgan Park and 79th and Halsted streets.

Galion, O.—The Ohio Central Traction Company has decided to construct the Crestline branch of the electric road and work on the same will be begun early in the spring. It is estimated that the Crestline extension will cost about $75,000. F. C. Boyd is vice-president of the company.

Goshen, Ind.—A company of 35 local capitalists will soon be formed to construct an electric line from this city to Lake Wawasee. The road is to be built by J. J. Burns.

Indianapolis, Ind.—The Indiana & Ohio Traction Company was lately incorporated with $750,000 capital stock to build an electric road to connect the cities of Marion, Huntington and Ft. Wayne in Indiana and Hicksville in Ohio. J. H. Simonson, P. R. Smith, J. D. Olds and J. W. White are interested.

Marinetta, Wis.—According to a statement made by I. Stephenson, president of the Escanaba & Lake Superior Railway Company, the road will be operated by electric power within two years.

Mt. Pleasant, O.—J. A. White of this city is interested in an electric line extending from Newcomerstown to Wheeling via Uhrichsville and Cadiz. Mr. White is now seeking to interest capitalists for its early construction.

Pine Bluff, Tenn.—G. F. Crater and R. M. Unall, capitalists from New York, have been here with a view to building an electric street railway and light plant.

Portland, Ind.—The Oil Belt Traction Company, a corporation organized about one year ago to build an electric road from here to Huntington, reports that funds have been secured and work will begin within 60 days. The road will be 61 miles in length.

Saginaw, Mich.—It is now practically settled that the Saginaw suburban electric railway will be in operation by July 1, 1901.

Upper Sandusky, O.—The Galion-Bucyrus electric line will be extended from the latter place here, and $125,000 have been appropriated for the same. The distance is 17 miles.

Waterbury, Conn.—The New Haven road will equip its New England line between this city and Bristol with electricity.

MANUFACTURING.

Denver, Col.—The Gardner Electric Drill & Machinery Company, a new Denver corporation having a capital stock of $1,000,000, is arranging for the purchase of a site upon which to build a factory for the manufacture of tools and machinery.

Pasadena, Cal.—The arrangements for pushing the work of the California Electrical Manufacturing Company are progressing. In its earlier operations the company will be principally engaged in the manufacture of glass for use in connection with electrical appliances, but it will ultimately undertake the manufacture of sockets and switches and all the brass and bronze standard goods used in electrical work.

COMPANY MATTERS.

Albany, N. Y.—The New York & Queens Electric Light & Power Company filed with the Secretary of State October 17 a certificate of increase in the number of its directors from three to seven, and of the election of Harrison E. Gawtry, G. F. Baker and J. Levering Jones as additional directors.

Boston, Mass.—It is reported that the Boston & Montana Company is figuring on enlarging the electrolytic plant so as to give it a capacity of 8,000,000 or 10,000,000 pounds of copper each month.

Des Moines, Ia.—The Tri-City Electric Company of this city has been awarded the contract for wiring the new collegiate building at the State University and for furnishing the electrical fixtures.

Gates' Mills, O.—A recent fire destroyed the car sheds of the Cleveland & Eastern Electric Railway Company here.

POWER AND TRANSMISSION PLANTS.

Hanford, Cal.—An electric company has been formed here with a capital stock of $5,000,000, with A. Guthrie president and E. Kanutzs secretary. The object of the concern is the erection of a plant to develop electric power on the San Joaquin River, 180 miles from San Francisco.

Millbury, Mass.—The Worcester & Blackstone Valley Street Railway Company has leased the Millbury Cotton Mill for a power plant. The capacity is 250 horse power.

Newark, N. J.—The Hunterdon Water Power Company has been formed here to distribute water and electric power with a capital stock of $2,000. Among those interested are E. A. Day, Morristown; W. T. Day, Elizabeth, and J. T. Congleton, Newark.

Riverside, Cal.—There is a report current to the effect that the Chase Nursery Company is about to install an 800 horse power electric plant at Ethanac, which will be used later in connection with a sugar beet project.

MINES.

Dawson City, Can.—It is claimed that the electric light companies of this city are making preparations to furnish power from Dawson to many of the mines on Bonanza and Eldorado creeks. The main electric plant of Dawson has been increased to 800 horse power and a 500 horse-power boiler is being installed.

AUTOMOBILES.

Des Moines, Ia.—Jesse O. Wells and L. J. Wells of this city are thinking of starting an automobile factory. The machines which have been turned out have given satisfaction, but the promoters want to perfect the details of manufacture.

Farmington, Conn.—A plan is on foot to establish an electric charging plant here for the use of those visiting the Elm Tree Inn and the Country Club in automobiles.

Homestead, Pa.—Dr. J. Boyle, F. W. Brockman and H. C. Keyes are the promoters of the company formed here for the purpose of manufacturing automobiles.

Williamsport, Pa.—The Union Automobile & Transportation Company has been formed here for the purpose of transporting persons in automobiles. The capital stock of the company is $500,000.

Wilkes-Barre, Pa.—Arthur F. Huey, general superintendent of the Ricker Motor Vehicle Company of Elizabethport, N. J., and Mr. Gunster, the president of the local company here, have lately been looking at properties with the view of obtaining a suitable stable for the 'buses. They not only have to be sheltered, but there must be electrical appliances for charging the batteries.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Oct 22						
United Traction	100	$5,000,000	$5,000,000	1¼ % Q.,	117	119
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Oct 22						
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Oct 22:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Oct 22						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	16½	18¾
Boston, Mass.—Oct 22						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	98	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	145½	146
Brooklyn N. Y.—Oct 22.						
Brooklyn City Ry	100	2,000,000	1,928,400	....	229	231
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	48,000,000	....	58¼	5[illegible]¼
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—Oct 22:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., 99	99	100
Columbus O.—Oct 22						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	87	90
Charleston, S. C.—Oct 22						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—Oct 22						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	250	255
Chicago & South Side R. T. RR.....	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	33	33⅛
Met. West Side El., pfd	100	15,000,000	9,000,000	....	81	81¾
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	99	99½
Union Traction Ry.............com.	....	1,250,000	624,900	35 %	11½	12½
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	46¾	47
Cincinnati, Ohio.—Oct 22:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Oct 22.						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Oct 22						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—Oct 22:						
City Railway Co..............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,-00 stock guaranted by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Oct 22						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Oct 22						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Oct 22.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind—Oct 22.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	15	18
Lancaster, Pa.—Oct 22						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry.....	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Oct 22.						
Louisville Ry.................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry................... pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.—Oct 22						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	...	3,000,000	1,712,200	1¾ %. Oct.	136	137
Montreal, Canada.—Oct 22						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	267	297½
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	109½
Memphis Tenn.—Oct 22:						
Memphis Street Railway Co	100	500,000	500,000	....	25	--
New Haven, Conn.—Oct 22:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	--
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Oct 22						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Oct 22:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	125
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	154⅞	155
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109½
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Oct 22:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	57	60¾
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	*n* 1¾ % A.	16	19
Pittsburg, Pa.—Oct 22:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	60	61
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72½	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..............com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co..............pref	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Oct 22						
Union Street Railway Co.	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass—Oct 22						
Northampton Street Ry.............	100	300,000	225,000	4 % A., June.	170	173
Omaha, Neb.—Oct 22						
Omaha Street Ry....................	100	5,000,000	5,000,000	8 % A. and N.	55	65
Paterson, N. J.—Oct 22:						
Paterson R. Co .... —	100	1,250,000	1,250,000	....	54	—
Prov[illegible]ce, R. I.—Oct 22:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Oct 22						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount....	50	1,966,100	|1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	8 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1, '99.	75	76
Union Traction Co........... $12½ pd	50	80,000 000	29,930,450	....	36⅞	37
bElectric Traction Co.............	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry.........	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	|1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co.........	50	1,000,000	....	....	48	...
fLombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry....	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
ePeople's Traction Co............	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
gGermantown Passenger Ry....	50	1,500,000	|572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	|150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	|740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	|277,402	....	...	...
iPhiladelphia Traction Co........	50	30,000,000	|20,000,000	$2 p. sh., Oct. 98.	95¼	96½
jCatherine & Bainbridge St......	50	....	|400,000	6 % A—Mar., '98.	...	..
iContinental Pass. Ry.....guar..	50	1,000,000	|580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co......	50	600,000	|600,000	....	...	..
jPhiladelphia City Pass. Ry......	50	1,000,000	|475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR..	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry....	50	750,000	|420,000	$12 share, July '98.	308¼	309
jPhiladelphia & Darby Ry.guar.	50	....	|200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar...	50	....	|250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	|835,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co........	50	1,500,000	|900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry....	50	750,000	|750,000	$10 share, July '98	262	263
Rochester, N. Y.—Oct 22						
Rochester Railway Co............	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Oct 22						
jReading Traction Co................	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry................	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry..........	50	1,000,000	‡1,000,000	Jan., '98.	70	..
St. Louis Mo.—Oct 22						
Fourth Street & Arsenal Ry.........	50	800,000	150,000	....	..	..
Jefferson Avenue Ry. Co............	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry...........................	100	2,500,000	2,400,000	1¼ % Jan.,'99.	..	..
National Railway Co................	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds....	..	2,500,000	2,500,000	....	..	..
Citizens' RR.........................	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR.........................	100	2,000,000	2,000,000	2½ %, Jan., '99.	..	..
Missouri RR.........................	50	2,400,000	2,800,000	1½ % Jan., '99.	..	..
People's RR. Co.....................	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry...............com.	50	500,000	500,000	....	20	21
United Electric Ry.........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
[S]t. Louis & Suburban Ry............	100	2,500,000	2,500,000	....	68	70
Union Depot RR......................	100	4,000,000	4,000,000	3 % A., July, '99	..	..
San Francisco, Cal.—Oct.						
California St. Cable RR..............	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.......	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry....................	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63½
Presidio & Ferries RR...............	100	1,000,000	550,000	....	..	16
Scranton Pa—Oct 22						
Scranton Railway Co................	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	..	..
Springfield Ill.—Oct 22:						
Springfield Consolidated Ry	100	750,000	750,000	....	..	..
Springfield O.—Oct 22						
Springfield Street Ry..................	100	1,000,000	1,000,000	....	..	11
Springfield, Mass.—Oct 22						
[S]pringfield Street Ry...............	100	1,200,000	1,166,700	3 % A.	207	212
Toronto Canada.—Oct 22						
Toronto Street Ry....................	100	6,000,000	6,000,000	1¾ % S.	§ 100¼	102¼
Montreal Street Railway Co.........	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Oct 22						
Belt Ry. Co...........................	50	500,000	500,000	....	..	..
Capital Traction Co..................	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co.....................	50	400,000	400,000	6 % A.	..	...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.....	50	200,000	200,000	....	20	21
Metropolitan RR. Co.................	50	1,000,000	458,900	2½ % Q.	..	..
Worcester, Mass.—Oct 22						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	81	82½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Oct 22:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. | Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

[l] Dividend of 6 % guaranteed by Reading Traction Company.

[m] Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 22						
American Tel & Tel Co	100	50,000,000	23,650,000	4½ % Q., Jan.	147	148
Erie Telegraph & Telephone Co...	100	......	......	1 % Q., Feb. 20,	95	98
New England Telephone Co........	..	10,894,600	10,804,600	$1.50 p. sh. Feb	124½	125
New York.—Oct 22						
American Telegraph & Cable Co...	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.....	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co..............	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co..............	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co..	100	5,000,000	3,723,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.........	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co...	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.......	..	......	97,370,000	1¼ %, Q, Jan. '99.	80	80½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Oct 22:						
American Dist. Teleg. (Phila.).....	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)...	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co.............	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.......	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co.......	50	.... .	......	....	94½	95
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 22						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	....	....	36	48
†General Electric Co. [old] .. com.	100	40.000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	144⅞	145
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Oct 22						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,938,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	..	..
Edison Ore Milling Co..............	100	....	......	....	8	12
Electric Vehicle Co..............com.	..	....	......	....	..	..
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	141⅞	141
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	..
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Oct 22						
Allegheny County Light Co........	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.........	50	300,000	300,000	Q	..	..
Philadelphia, Pa.—Oct 22						
Edison Electric Light Co...........	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	50	60
*Electric Storage Battery Co...pfd.	100	5,000,000	.. ...	......	55	65
Northern Elec. Light & Power Co..	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	..
Miscellaneous.—Oct 22						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co..............	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.......	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)...........	..	1,000,000	.....	2% Q ‡	193	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1¾ % Q	183¾	185
Thomson-Houston Welding Co.......	100	......	......	8 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.....	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Oct 22.						
American Electric Heating Co.........	50	10,000,000	....	....	..	..
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	..	..
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	..	100
New York.—Oct 22:						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co.........com.	100	5,500,000	5,500,000	......	..	..
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Oct 23						
Electro Pneumatic Trans. Co	10	1,500,000	......	——	8¼	8½
United Gas Improvement Co..scrip.	50	10,000,000	......	——	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	——	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co..................	5	525,100	......	....	43	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1½
Pittsburg, Pa.—Oct 22.						
Carborundum Mfg. Co...............	100	200,000	200,000	....	..	
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Oct 22.						
*Barney & Smith Car Co.......com.	100	......	1,000,000	——	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	96
Billings & Spencer Co..............	25	......	....	....	32	..
Consol. Car Heating Co.............	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co......................	100	....	....	——	105	109
*Pratt & Whitney Co...........com.	100	......	....	——	2	4
*Pratt & Whitney Co............pfd	100	....	......	——	40	50
Stillwell-Bierce Co..............com.	..	....	....	——	..	50
Stillwell-Bierce Co...............pfd.	..	....	....	2 % Sept 1,'99.	50	60
Shultz Belting Co....................	100	500,000	....	....	80	60
St. Charles Car Co	..	......	......	....	80	100

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany, N. Y.

Date of Quotation—Oct 22, 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
The Albany Ry. Co……Cons. mtg. 5s.	$500,000	427,500	1987	J. & J.	117½	….
†The Albany Ry. Co……Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	……
‡Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	127½
‡Watervliet Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co……1st 5s	….	….	1942	……	*116½	……

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Oct 22, 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
United Electric Ry. Co…1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ……income 4s.	14,000,000	…………	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co……1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	……
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	………	1900	J. & J.	101	……
†Baltimore Traction Co. Convertible 5s.	800,000	………	1906	N. & M.	102½	……
†Central Pass. Ry. Co……1st mtg. 6s	96,000	117,000	1912	J. & J.	……	….
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1982	M. & N.	119	121
†City & Suburban Ry……1st mtg. g 5s	8,000,000	8,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ……1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	……

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Oct 22, 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
†Lynn & Boston RR……1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry……Deben. g. 5s.	8,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry……Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	….

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
†Enterprise Street RR……1st mtg. 5s.	500,000	47,000	1906	J. & J.	…	….
†Charleston City Ry……1st mtg. 6s.	850,000	….	….	J. & J.	106	….

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Chicago City Ry……1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry……1st mtg. 6s.	400,000	400,000	1903	F. & A.	….	102
‡Chicago Passenger Ry…Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	……	….
¶Chicago & So. Side R. T…1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	….	….
Chicago & So. Side R. T……4½s.	1,500,000	750,000	1907	J. & J.	….	……
‖Chicago West Div. Ry……1st mtg 4½s,	4,040,000	4,040,000	1982	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	….	……
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR……1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	……
North Chicago St. RR….Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	….	……
North Chicago City Ry……1st mtg. 6s.	500,000	500,000	1900	J. & J.		……
North Chicago City Ry……consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	……
West Chicago St. RR……1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	……	111
West Chicago St. RR……Deben. 6s…	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR….Con. mtg. g. 5s.	12,500,000	6,000,000	1936	……	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	….	….

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In…1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	……
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	……
So. Cov. & Cin. St. Ry……1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry……2d mtg. 6s.	400,000	400,000	1982	J. & J.	182¾	187

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Oct 22 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
aBrooklyn Street RR. Co……1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry….1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry…1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	……	……
aEast Cleveland RR……1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	……	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	………	1922	M. & N.	……	….
Lorain (O.) Street Ry……1st mtg. 6s.	200,000	200,000	1915	J. & J.	……	….
‡St. Ry. Co., Grand Rapids…1st mtg. 5s.	600,000	600,000	1912	J. & D.	….	….

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Oct 22 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
†Detroit Citizens' St. Ry……1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	……	102½
Ft. Wayne & Belle Isle Ry…1st mtg. 6s.	400,000	377,000	1902	A. & O.	….	
The Detroit Ry……1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Oct 22 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
New Haven St. Ry……1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	….
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	……
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	……
Winhester Avenue RR……Deben. g. 5s	100,000	24,000	1912	M & S	……	….

New Orleans La.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Canal & Claiborne RR……cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	……	….
Crescent City RR……1st mtg. 6s.	……	50,000	1899	M. & N.	105½	……
Crescent City RR……Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	……	….
New Orleans City RR……1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	……	……
Orleans Railroad Co……Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	……	……
‡St. Charles St. RR. Co……1st. mtg. 6s.	300,000	75,000	1906	J. & D.	……	……

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Atlantic Ave. (Brooklyn)….Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	……
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	8,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave……1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave……2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface……1st mtg. 5s.	1,125,000	1,125,000	1924	……	115	117
Broadway Surface……2d mtg. 5s.	1,000,000	1,000,000	1905	……	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	….
Brooklyn Heights RR……1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	……
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	….
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	….
Brooklyn Rapid Transit……gold 5s.	7,000,000	5,181,000	1945	………	109½	……
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	……	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR……1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	……
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co……Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	….
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	……
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	……
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry……Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)……1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co……1st mtg. 5s.	850,000	850,000	1919	……	110½	112½
Third Avenue RR……1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	……	128½
Twenty-third Street Ry……1st mtg. 6s.	………	………	1909	J. & J.	……	….
Twenty-third Street Ry……Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry……1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR…1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Oct 22 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Montreal St. Ry……1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	….	….
†Toronto St. Ry……1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	….	….

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Continental Pass. Ry……1st. mtg. 6s	850,000	810,000	1909	J. & J.	….	….
Empire Pass. Ry……1st mtg. 7s	800,000	200,000	1900	J, & J.	….	….
Greene & Coates St. Ry……1st mtg. 6s	100,000	100,000	1898	J. & J.	….	….
Lombard & So. St. Pass. Ry…1st mtg. 6s	150,000	………	1901	……	….	….
People's Pass. Ry……1st mtg. 7s	250,000	250,000	1905	J. & J.	….	….
People's Pass. Ry……2d mtg. 5s	500,000	458,000	1911	J. & J.	….	….
People's Pass. Ry……Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	….	….
People's Pass. Ry……Stk. trs. cert. g. 4s	5,698,210	……	1948	…	….	….
Phila. City Passenger Ry……1st mtg. 5s	200,000	200,000	1910	J &	……	….
Philadelphia Trac. Co……Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	……	……
Thirteenth & 15th St. Ry……1st mtg. 7s.	100,000	100,000	1908	A. & O	….	….
Union Passenger Ry……1st mtg. 5s.	500,000	500,000	1911	A. & O.	….	….
§Union Traction Co……Col tr. 4s.	29,785,000	29,724,876	1945	A. & O.	——	……
West End Passenger Ry……1st mtg. 7s.	………	……	1905	……	….	….
West Phila. Pass. Ry……1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	……	….
West. Phila. Pass. Ry……2d mtg. 5s.	750,000	750,000	1926	M. & N.	……	……

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Oct 22 1900

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Birmingham, Knox & Allentown……6s.	500,000	500,060	1981	M. & S.	111½	….
Central Traction Co……1st mtg. 5s.	875,000	875,000	1930	J. & J	……	……
Citizens' Traction Co……1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	……	……
*Duquesne Traction Co……1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	….	……
*Fed'l St. & Pleas. Val. Jack's Run……5s.	50,000	50,000	1918	J. & J.	……	……
Fed'l St. & Pleasant Valley……Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	……	….
Millvale, Etna & Sharpsburg……5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield……5s.	250,000	250,000	1924	J. & J.	……	….
Pittsburg Traction Co……1st mtg. 5s.	750,000	750,000	1927	A. & O.	……	
Pittsburg & Birmingham……1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End……1st mtg. 5s.	500,000	500,000	1922	J. & J.	….	……
*Pg'h., Allegh. & Manch……Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	….	……
Second Ave. Traction Co……5s.	2,500,000	2,000,000	1934	J. & D.	……	….
Sub. Rapid Transit Railway Co……6s.	500,000	500,000	1912	M. & S.	……	….

Providence R. I.

Date of Quotation—Oct 22 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Newport Street Ry……Coupon 5s	50,000	50,000	1910	J. & D.	……	……
United Trac. & Elec. Co……1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Oct 22, 1900.

Name	Amount Authorized	Amount Issued	Due	Interest periods	Bid	Asked
Baden & St. Louis RR……1st mtg. 5s.	250,000	250,000	1918	J & J	101½	102¼
Cass Ave. & Fair Gds Ry……1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co……1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	109¼
Comp. Hts. Un. De. & Mer. Ter.—1st	1,000,000	000 000	191	J & J	17	

*With interest. *Unlisted.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation* - Oct 22, 1900.						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1906	M. & N.	108	106
Lindell Ry. Co..........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
‖St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry..................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*—Aug 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry......1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105¼	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Washington D. C. *Date of Quotation* – Oct 22 1900						
Belt Ry. Co.........................O…s mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.........................'s mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home, mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*– Oct 22, 1900.						
Bridgeport Traction Co.........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119¼
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	3,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry...................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105¼	106
St. Paul City Ry........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Oct 22 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*– Oct 22, 1900						
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co.Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Oct 22, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*– Oct 22 1900.					100½	101
American Bell Telephone.....................4s.			1908	F. & A.	......	....
NorthwesternTelegraph Co.................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Oct 22, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co...........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co.........................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16[illegible]@16[illegible]c.; **Lake**, 16[illegible]@16[illegible]c.; casting, 16[illegible]@16[illegible]c.

The Bell Telephone Company of Philadelphia has declared the regular quarterly dividend of 2 per cent., payable October 30.

The Columbus Railway Company has declared a dividend of 1¼ per cent. on its preferred stock, payable November 1 to stock of record October 18.

The Chicago Edison Company has declared a quarterly dividend of $2 per share, payable November 1. Books closed October 23 and reopen November 1.

The Trinity Copper Company has been incorporated at Trenton N. J., with a capital of $6,000,000. The company proposes to engage in all kinds of mining, but particularly copper.

The National Carbon Company has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable November 15. Books close November 5 and reopen November 16.

The regular quarterly dividend of 1½ per cent., guaranteed by the Union Traction Company of Chicago on the West Chicago Street Railway Company's stock, is payable November 15. Books close November 5.

The Rapid Transit Commission will ask permission of the city Government to begin the underground road to Brooklyn at an estimated cost of $8,000,000 but for legal reasons the work cannot be begun before next fall.

The Birmingham (Ala.) Railway, Light & Power Company, capital $1,500,000, has been formed by the consolidation of all the local traction companies. In all $3,500,000 bonds will be issued, of which $1,500,000 are for extensions and improvements.

Figures of production export of copper for September are as follows: Produced by United States reporting mines, 17,986 tons; by outside (estimated), 3,400 tons; by foreign reporting mines, 7,145 tons. Export: 10,245 tons, all in tons of 2,240 pounds of fine copper.

Assistant Corporation Counsel Carr of Brooklyn has brought a new suit against constituent lines of the Brooklyn Rapid Transit Company for about $300,000, claimed to be due as assessments for street paving and percentages of net earnings which were promised to the city.

A trust mortgage was filed at Saginaw, Mich., recently by the Saginaw Suburban Railway to the New York Security & Trust Company, in the sum of $800,000, to secure an issue of bonds for that amount. The bonds are to have a sinking fund of 10 per cent. of the annual net earnings of the company.

It is figured in street railway circles in New York, that under the readjustment of street railway taxes in Manhattan Island alone the assessment upon which the Metropolitan Street Railway Company must pay taxes, is raised from $5,000,000 to $35,000,000 while the assessment of the Manhattan Elevated Railway Company is increased only from $28,000,000 to $30,000,000.

The recent strength in United States Rubber common stock is attributed to the belief in certain quarters that dividends on it will be resumed before very long. One of the directors says that the question will not come up for consideration before the board of directors until early in January. At that time the company will be in a position to approximate at least the results of the current fiscal year, which closes in April.

The normal yearly increase in gross earnings of the Boston Elevated or West End Street Railway is about 5 per cent. If official estimates that the gross earnings for the year ended September 30, 1900, will show an increase of $500,000, are fulfilled, the percentage will be 5.2. In 1899 the increase was 5.5 per cent. In the last eleven years, however, gross receipts have increased 100 per cent., as in 1889 they were $5,249,9[illegible]2, and in 1900 they will be about $10,200,000.

The Boston and Worcester syndicate, which last March secured control of six electric roads operated in and around Worcester, Mass., is now before the railroad commissioners seeking to effect a consolidation of four of its properties for the purpose of more economical operation. Reports that these companies are to be consolidated with the Massachusetts Electric Companies are erroneous. They are not located within 15 miles of a connection with the Massachusetts Companies lines. The syndicate has in the vicinity of $2,000,000 invested in Worcester street railway properties, but as yet no corporation has been formed to take them over.

It is not probable, says the Boston "News Bureau", that the Western Union Telegraph Company will make as good a showing the last quarter of this year as for the corresponding period a year ago, notwithstanding the increased business that may arise from the election, as the Postal Telegraph Company has succeeded in capturing the German cable business which formerly went by the Western Union. This business amounted to over 300,000 messages a year, and while for years one could send a cable by the Postal lines to Germany, the return message under the Government system always went by the Western Union. Now the situation is reversed and the return messages are all by the Postal Telegraph Company which has the direct German connection.

No doubt exists in the minds of conservative people in the Street says the Philadelphia "Stockholder" that the Brooklyn Rapid Transit Company will before many months have elapsed be under control of Metropolitan Street Railway interests. Nothing official on this head can be learned, but strong intimations come that a deal looking to that end is impending. A gentleman in position to secure exclusive knowledge concerning both companies stated recently that Brooklyn Rapid Transit stock is "about the best buy on the New York list." He added that the stock will shortly start on its road to 65. What makes stories of Metropolitan control appear all the more feasible is the geographical position of the two systems. Both could be linked without necessitating the outlay of any large sum of money and the result of this cannot be anything but apparent.

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ELECTRICITY.

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EDITORIAL NOTES.

An Important Patent Suit.

In the issue of ELECTRICITY of June 27, 1900, we referred to the infringement suit of the Electric Smelting and Aluminum Company of Cleveland against the Carborundum Company of Niagara Falls, which had been dragging through the courts for several years. Now our Washington correspondent informs us that a petition for a writ of certiorari brought by the Carborundum Company against the Electric Smelting and Aluminum Company before the United States Supreme Court has been denied.

The appeal was brought from the United States Circuit Court of Appeals for the Third Circuit, to which Court it was brought from the United States Circuit Court for the Western District of Pennsylvania, in which Court the Electric Smelting and Aluminum Company brought a bill of complaint against the Carborundum Company for infringement of certain Letters Patent No. 319,795, granted to E. H. and A. H. Cowles, June 9, 1885, for a process of smelting ores by the electric current, known as the Cowles Process Patent; and Patent No. 319,945, granted to the same parties on the same date, for an electric smelting furnace, known as the Cowles Apparatus Patent. In the original bill a third patent was brought in question, but the case was later restricted to the two already named.

The case was heard before the Circuit Court, and on July 26, 1897, a decree was found for the defendant as follows:

1. That the defendant did not infringe the Cowles Apparatus Patent.

2. That the method of making carborundum used by the defendant differed from the method of the Cowles process, both in respect as to process, preparation of ingredients, means and objects, and did not infringe.

The case was argued before the Circuit Court of Appeals in 1898, and on January 30, 1899, that Court ordered a reargument, which was had on September 19-20, 1899. The Court filed its opinion on May 28, 1900, to the effect that the defendant had infringed certain claims of the Cowles Process Patent, and had not infringed the Cowles Apparatus Patent; it reversed the decree of the Circuit Court, with directions to enter a decree for the complainants, but without costs incurred theretofore by either party.

The Cowles process requires, first, that the operation is to be metallurgical. It begins with an ore, metalliferous in character, broken or granular in condition, which being smelted or reduced in a described manner, produces a metal or an alloy of metals. It requires a material or substance capable of carrying an electric current of high potential, yet not doing so readily, but only with difficulty; and hence such material must furnish considerable electrical resistance to the passage of the current. The material commonly used for the purpose is carbon in granular condition; these two ingredients, the ore and the carbon, are then mixed together into a mass, and when mixed are charged into a suitable retort or close chamber, and a powerful electric current is passed through it. The grains of carbon which have been distributed through the mass take and carry the current. They become highly heated by the resistance which they give to the passage of the current through them. Being in contact with the grains of ore, also distributed through the mass by the mixing, they heat up the grains of ore to the same high temperature, and the ore is thus smelted or reduced. In other words, the grain of carbon in the mass being heated by electrical resistance while in contact with the grains of ore in the same mass, communicate their heat directly to the latter, with reference to effecting the desired smelting or other reduction of the ore.

This mixing of the carbon and the ore into a single mass, whereby to secure contact of carbon and ore, grain by grain, is specifically described in the patent both as to how it is done, and as to why it is done, and, also, as to the results expected to be obtained by the process, as follows:

(a) As to the how and why it is done:

"The ore or like material to be reduced . . . is usually mixed with the body of granular resistance material (carbon), and is thus brought directly in contact with the heat at the points of generation; at the same time the heat is distributed through the mass of granular material, being generated by the resistance of all the granules, and is not localized at one point or along a single line."

(b) As to the results:

"The electrical energy is more evenly distributed, and the current cannot so readily form a path of highest temperature and consequently of least resistance through the mass, along which the entire current or bulk of the current can pass."

No other procedure, other than that de-

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scribed above, is claimed for the Cowles patent, and it is necessarily limited in character.

As to the method pursued by the Carborundum Company. Some five or six years after the date of the Cowles patent, Mr. E. G. Acheson, now the president of the company, in the course of some experiments which he was making, discovered a new substance, that is to say a substance which was wholly unknown in the practical arts and equally unknown in the scientific world; it consisted of a compound of silicon and carbon and subsequent investigation showed it to be not only new but of enormous practical value in the mechanical arts, and as a convenient trade name he called it carborundum.

While it is used in a crude form, that is in the form in which it is manufactured, for a few purposes, as in steel making, its chief value is as an abrasive or grinding material. It has almost entirely supplanted the use of emery in the mechanical arts, as for similar purposes it has been found to be from three to eight times more efficient than emery in different classes of work.

The process is as follows: A mixture is prepared of fine granular carbon and sand, with a percentage of salt and sawdust, called the "charge-mixture." In the furnace used by the Carborundum Company this mixture is surrounding a central core, made of coarse granular carbon. No ore or other material enters into its composition. It is of about the diameter of a flour barrel, and about 16 feet in length. The electric terminals of the circuit are electrically connected with the ends of the core at the opposite ends of the furnace. The charge-mixture surrounds the core throughout its length, on top, bottom and sides, to a thickness of about two feet. In this process the electric current follows or traverses the core alone, and does not follow the charge mixture. On this point the Circuit Court said:

"While, as we have said, absolute certainty is impossible, we are, by a most patient and detailed study of the case, left to two conclusions. First, the weight of the proof and the reasons advanced, failed to show that a substantial, effective part of the current passes through the charge-mixture in respondent's process, and secondly, the clear weight of the evidence tends strongly to show that the working effective current is confined to the central core in respondent's workings."

It is claimed by the Carborundum Company that the two processes are directly the reverse, the one of the other.

The reasons for which the case was brought to the Supreme Court were:

The magnitude of the public interests involved in a correct determination of this cause. It being claimed that if the conclusions arrived at by the Court of Appeals be correct, that the Cowles Process Patent can lawfully dominate the use of a distributed and a non-distributed current, then it is believed that a onsiderable percentage of the manufacturing establishments now centered around the electric-generating plant of the Niagara Falls Power Company will become subject to the patent in question: specific reference being made to that Company, not because it was the only company of its kind, nor because its interests were exceptional or exceptionally great, but because of its organization, its purpose, and the character and extent of its business being matters of general public knowledge, and was thus best suited for the purposes of illustration.

The Niagara Falls Power Company has an investment represented by $13,000,000 securities, and it has a large interest in the correct solution of the problem. The Carborundum Company is only one of the many manufacturing plants that buys its electric power from the Niagara Falls Power Company: the amount of capital which it has invested in the business of making and selling carborundum and carborundum products is something over $400,000; its entire plant and apparatus is exclusively for this purpose. Its production is about 1,700,000 pounds of carborundum per year. This carborundum is used largely in steel making, in granite polishing, for which it supplies over 90 per cent. of the abrasive material used in this country and in Scotland: in the dental profession; in the manufacture of domestic hollow ware; in machine fitting; in the manufacture of pearl buttons, etc., and thus, indirectly all these interests were concerned in the settlement of the question.

It is stated that the plant in question is the only one of its kind in the world, and that the decision that the Supreme Court has rendered will suppress the entire industry.

Evidently the Supreme Court took the same view of the case as did the Electric Smelting & Aluminum Company, which called the attention of the Court to the fact that the patents granted to Cowles were the first granted anywhere in the world for incandescent electric smelting: that is, smelting in which the heat of a resistance material rendered incandescent by the passage of an electric current, in distinction from the heat generated by an electric arc, hence the term "incandescent electric smelting." They also claim that there was no invention of carborundum by Mr. Acheson, but that he simply found out, the real composition was of the material which the Cowles brothers had discovered years before, and which had been described by them at various times through the public press; because they abandoned a further pursuit of the process for others that they deemed of more commercial value does not militate against the priority of their patent, nor could a play upon words be allowed to result in the destruction of the substantial rights which they held.

Again the statement of the Carborundum Company that so many interests would be injured, would seem to be refuted by the fact that all of the manufacturing concerns obtaining their power from the Niagara Falls Company and in other localities, are obtaining their results as licensees of the Cowles Process, one of the firms alone renting 14,000 electrical horsepower per day from the company named.

The statement of its commercial import has also been challenged, by a resumé of the abrasives used in the United States during 1899, of which carborundum amounted to 850 tons. For abrasive purposes, 735 tons; natural abrasives, more than 20,000 tons; other artificial abrasives 337 tons; natural grindstones, whetstones, etc., to a value of $911,984.

* * *

Electric Guns. For several years inventors have been at work, both in this country and abroad, trying to devise some means of applying electricity to the firing of cannon. About two years ago a resident of Washington thought he had hit upon the solution of the problem, and suggested firing shell through a solenoid by means of an electric current and a complicated system of automatic switches. Still more recently a resident of New Orleans brought out an electric gun—the model of which, by the way, was about the size of a lead-pencil—for which great things were hoped, while only a week or two ago advices from England stated that a gentleman living at Newcastle had invented an electric quick-firing gun with "startling features." This gun, which is primarily intended for naval warfare, is based, so it is claimed, upon entirely new features. The base of the gun is conical, with two vertical supports, which carry the centrifugal mechanism, with a small electric motor fixed on the side. This motor would receive its power from the electro-generating plant, which forms a portion of the equipment of every warship. The current may be transmitted to the fighting tops, or any other desirable part of the vessel. The power thus transmitted to the motor causes the gun disk to revolve at a high velocity. The shots are absorbed by the gun automatically and by the movement of a small lever. The inventor states that the gun can fire anything up to over 3,000 shots per minute, with a muzzle velocity approaching 2,000 feet per second. These shots are impelled without explosives by centrifugal motion; consequently, during process of firing there is an absence of both noise and gun recoil. The gun can also be placed upon a light carriage, or motor platform for field purposes, the power being generated by a small oil-motor mounted on a light gun-carriage with generative electric machine, thus supplying any number of guns, over any area, from the one reservoir. The gun is worked by two men, who are effectually protected behind a light shield. It will fire round a complete circle, and possesses a vertical range of 90 deg. It stands five feet in height and weighs about 6 cwt.

We have no desire to decry things electrical, but in our opinion it will be some time before a real electrically operated gun is brought out, and when it does arrive it will not be worked on the lines laid down by some of the recent inventors.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE New York Telephone Company is putting in 800 special telephones for election purposes.

THE splendor of the electrical illuminations and decorations of the Parliament buildings at Ottawa during the Queen's jubilee celebration three years ago, will be surpassed in extent and magnificence on the occasion of the return of the Ottawa soldiers from South Africa, whose home-coming is now daily expected. The Government, in addition to the city's decorations, will spend over $10,000 in the electrical display on the Parliament buildings, and which is expected to be the most splendid ever given in Canada.

ALL of the down-town conduits of the system of electric subways in the City of Baltimore will be completed, and the wires now overhead placed in the ducts, by January 15, according to the commission in charge of the work. The companies now using over-head wires will be notified by letter and will be charged a nominal sum for the use of the ducts. Leases will extend for periods of six months, and may be abandoned on six months' notice to the city.

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Electrical men will have a separate division in the sound money parade, which will take place in New York City on November 3. In 1896 the electrical contingent was split up, most of it being in the metals and machinery division. From present indications no less than 3,000 marchers will be in line from the electrical industries,

The disastrous fire and explosions in the drug house of Tarrant & Co., on the northwest corner of Warren and Washington streets of this city, which occurred at noon on October 29, and through which over 100 persons lost their lives, destroyed not only a portion of the Ninth avenue elevated structure, but also the up-State wires of the Western Union Telegraph Company. Over one million dollars' worth of damage was done, to say nothing of the appalling loss of life, all through the proper authorities allowing a firm in the heart of the community to store an excessive amount of explosives. If any other drug firm in the city is carrying a large stock of similar goods, they should be speedily made to transport them out into the country.

A suburban electric street car-line in St. Louis, Mo., has fitted one of its cars with a telephone for trial, says the "Railway and Engineering Review." The instrument is placed in the rear of each car, the negative wire being connected permanently through the wheels to the rail and the positive wire being fitted with a simple device resembling a jointed fishing-pole by which connection is secured with a private overhead wire paralleling the trolley.

Vice-Consul Harrison, at Asuncion, says that the Paraguay Development Company, incorporated with a capital stock of $500,000, under New Jersey laws with headquarters there has been granted by the Paraguayan Government a concession to light the City of Asuncion and to run tram cars by electric power.

The question of the utilization of the waterfalls in Victoria for the generation of electrical energy having been raised, Mr. Jas. Stirling, a geologist of the British Government, has in his report for March given a list of the waterfalls which have come under the notice of the officers of the Geological Survey. The list gives the name of the falls, the locality in which it is situated, and the height of the fall. The fall having the greatest drop is the Yarra Fall, which has a drop of about 1,000 feet. The next highest fall is one on the Dondangadale River, which drops some 400 feet. The height of the other falls ranges between 300 feet and 28 feet. Some of the streams are liable to cease running during very hot periods, but the majority of the streams are perennial. Several of the water-supply weirs could, says the London "Electrical Engineer," well be used to store water for the generation of electricity, and one of them—the Goulburn weir—actually is used to generate electricity for lighting purposes.

News from Tacoma, Wash., states that steamers in from St. Michael bring word that the United States telegraph system in the Yukon will be completed from Nome to Tanana by Christmas. The line from Dawson northward to Eagle on the American side will be finished shortly. The line between Dawson and the outside is now about completed. So by Christmas the stretch between Eagle and Tanana alone will remain to be built to connect Nome with the world at large. That stretch is 800 miles. The telegraph constructors of the United States are scattered along the Yukon from Eagle to Nulato, at the point of beginning of the over-land cut-off to Nome, in numerous crews.

Among the novelties promised at the Automobile Show, to be held in this city from November 3 to 10, is to be an artificial hill over which the automobiles will climb.

Acetylene gas has again been heard from. On October 28 a minister of the Gospel in Austin, Ill., was adjusting an acetylene gas generator in his church when it exploded, inflicting injuries which it is thought may prove fatal. The church was damaged to the extent of $3,000.

A deputation from Ottawa has waited upon the Ontario Government for the purpose of obtaining authority of the Government to use the power in the Ottawa River of the rapids at Britannia. The company is known as the Metropolitan Electric Company, and it is said that it intends establishing a pulp mill to be run by electric power.

The new Russian battleship Retvizan was launched at Cramps' ship yard at Philadelphia on October 23. Very elaborate arrangements have been made for insuring a continuous supply of ammunition to the rapid-firing guns. The turrets will be operated by electricity; in fact, many of the auxiliary machines usually operated by steam will on this vessel be driven by electricity.

The development of the use of electricity during the past few years has created a demand for mica as an insulating material. Much of the small-sized mica, formerly of little value, if not altogether unsalable, now finds a market among electrical manufacturers. Part of this small mica is reported in the sheet-mica products, and as it sells for much less than the larger sizes, which are used in the manufacture of heating stoves, lamp-chimneys, etc., it has the effect of making an apparent decline in values. On the other hand, part of the small-sized sheet-mica used for electrical purposes is reported as scraps, and in this case causes an augmented value.

Great results are expected from a new discovery of a Mr. De Gall, inspector of forests at Lamur, France, according to a dispatch received at the State Department from Vice-Consul General Hanauer at Frankfort, Germany. The new invention is a method of producing a wood impervious to water and acids alike, and a perfect electrical non-conductor. That is accomplished by means of dry distillation and high pressure which prevents the escape of developing gases and reduces the wood to a hard body of the character of coal, yet without a trace of the organic structure of that mineral. This new body, though hard, can be shaped and polished at will.

Remarkable electrical disturbances are often produced by the salt storms from the plains along the high voltage line running from Provost, Utah, to Tintic. On account of the moisture in the air and the thick covering of the poles with salt, powerful discharges occur at frequent intervals: short circuits are momentarily caused; the lights dip, and sometimes the operation of the motors is interfered with. These discharges are usually of dazzling brilliancy and at times startling. The flames are said to reach a height of from six to eight feet, holding for a second or two, then break from one of the wires and die away. It is only when the arc is continuous between the wires that there is any interruption of the service. One flash which blew out the station fuses and caused a shut down held its place between the wires for five or six seconds, but most of the flashes cease almost on the instant of completing connection.

The penny-in-the-slot system of distributing gas through the poorer and artisan districts of London, England, has been so successful that attempts are now being made to supply the electric light in the same way. The vestry of Battersea has erected a large generator station which is nearly completed, and laid the necessary cables down in the roads. The fixtures are installed in the house free of cost to the customer, who simply pays for the amount of electricity he consumes. The profit derived from this method of distribution is sufficient to enable the authorities to recoup themselves for the initial cost of the installation of fittings in the houses.

The possibilities of some of the suburban electric street railroad lines as freight carriers are now being ascertained to some extent by the Washington, D. C., Traction and Electric Company. Mr. T. F. Alvey has been placed in charge of this department, which has been newly created. On two of the lines—that to Rockville and the eastern section of the Columbia road—a freight service has been established. As the entire undertaking is experimental, the details are being worked out according to the demands of the business. The importance of the territory traversed by these lines, especially as to the prospects of yielding a traffic of this nature, no doubt led to their selection by the company for the initial trial.

Electric railways are making rapid progress in Australia. In Sydney the Government is replacing section after section of the old steam railroad with the trolley wire. According to a communication from Sydney private enterprises in the electrical line are not idle. In Brisbane the tramway company is seeking powers to enlarge extensions, and in Melbourne the suburban authorities are proposing a trolley line connecting the suburbs with each other directly. As American engineering concerns in the electrical line are advantageously competing, in all probability a good share of the material, etc., needed will go from this country.

A special meeting of the board of directors of the Electrical Contractors' Association of New York State was held at Buffalo last week. The various associations were represented by their directors as follows: New York City by President Charles H. Endlity; Utica by W. H. Morton, of the firm of Johnson & Morton; Syracuse by President James Hilton, of Rodgers & Hilton; Rochester by Rudolph Schmidt, and Buffalo by J. C. Sterns. After the meeting the president of the Buffalo Electrical Contractors' Association, H. I. Sackett, together with its members, Messrs. Mann, Ford, Jones, Brehm and Wilhelm, met the delegates. The visitors were entertained at dinner after which two automobile 'buses furnished a very enjoyable ride. The whole party attended the theater and a supper followed.

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COMPARISONS OF THE VARIOUS SYSTEMS OF ELECTRICAL DISTRIBUTION FOR STREET RAILWAYS.*

BY C. F. BANCROFT.

In preparing a paper on "Comparisons of the Various Systems of Electrical Distribution for Street Railways," the subject selected by the executive committee, I find that the conditions to be met in the numerous localities where the various systems are in use are so widely different, and each system so generally satisfactory, under certain conditions, and so completely unsatisfactory for meeting other conditions, that comparisons are altogether impossible, except, in a very general way.

There are six systems of electrical distribution for street railways at present in more or less general use.

First, what may be called the standard 500-volt continuous current system, where the current is generated at from 500 to 600 volts and delivered direct to the car motors, usually by means of a feed-wire and a trolley, third rail or underground conduit.

Second, what may be called the alternating direct current system, where the power is generated as alternating current, usually at high voltages of from 5,000 to 15,000 volts, and transmitted to sub-stations, where the voltage is usually reduced by means of static transformers, transformed into direct current by rotary converters, and delivered to the lines at about 500 volts continuous current.

Third, the "booster " system, where the current is generated usually at about 550 volts and where, by means of an auxiliary generator, usually series wound, called a "booster," additional voltage is generated and compensates for that lost on the line.

Fourth, the so-called three-wire system, where the current is generated at about 1,000 volts, usually by means of two 500-volt generators connected in series, and is delivered to two motors or two groups of motors in series.

Fifth, the alternating current system, where the power is generated as alternating current, usually at high voltage, and transformed down to about 500 volts at the trolley wires by means of static transformers, which may be located on the poles supporting the feed-wire and trolleys, the cars being equipped with alternating current motors.

Sixth, the storage battery system, where the batteries are carried on the car and charged at the power house or at special points on the line. Storage batteries can also be used to advantage in connection with any of the above systems under certain conditions, and in fact combinations can be made of any or all of the above systems.

For any given conditions as to speed, traffic and length of line, some one the above systems is likely to be much better fitted and more efficient than any of the others; therefore, it seems to me that a comparison of the various systems can best be made by considering the particular conditions most favorable to each. In the distribution of power for street railways the result to be aimed at is usually the maintenance at variable loads of an approximately constant pressure of 500 volts on the trolley wire at a minimum total cost for power.

The cost of generating electric power under the same conditions, as regards fuel, depends to a great extent on the amount of power generated and the capacity of the generating apparatus with reference to the average output required. Under ordinary operative conditions, with the same power factor, that is, the same ratio of output to capacity, the cost of power per kilowatt hour from stations of less than 500 kilowatt capacity increases very rapidly as the station decreases in size. With from 500 to 1,500 kilowatt capacity, the cost of power per kilowatt hour decreases slowly as the size of the station increases. From 1,500 to 2,500 kilowatt capacity the cost per kilowatt hour decreases very little as the output increases, and above 2,500 kilowatt station capacity the cost of power per kilowatt hour becomes nearly uniform. This is due to the fact that in small plants the labor item is disproportionately large and the general efficiency less than in larger ones, while in plants of 1,500 kilowatt output and larger the cost of labor remains proportionately nearly the same as the plant increases in size. It follows from this that there is often very little or nothing to be gained from an economical standpoint by substituting one station of 5,000 kilowatt capacity for two of 2,500 kilowatt capacity each, provided the local conditions, as regards cost of coal, water, etc., are the same.

The system of distribution most suitable to a particular road, depends to a great extent on the location of the power station or stations and the nature of the load. It is always expensive to transmit power, the expense being either in interest on copper investment or in fuel or both, and, therefore, other things being equal, the location of the power station or stations should be as near the load or center of distribution as possible. The location of the station is, however, usually governed to a considerable extent by local conditions as regards cost of fuel, water and real estate.

On a large system, requiring an average output of 12,000 kilowatts, even though the load be distributed within a five mile radius of a practical station location, it will usually be found economical to generate this power at several smaller stations rather than at one large station, provided the conditions as regard cost of fuel, water, and real estate are about the same, as the cost of power station buildings and machinery per kilowatt of capacity and the cost of generating power per kilowatt hour, with a station of 5,000 kilowatt capacity, is about the same as at a station of 10,000 kilowatt capacity. The interest on the saving in cost of feed-wire by having several stations, each located near its load, would more than offset the slight saving in cost per kilowatt hour, due to the generation of power at one large station, and it also has the advantage that in case of fire or accident to one station, the other can usually be so interconnected as to temporarily carry the entire load, and thereby avoid much of the stoppage of traffic which would occur if the road was supplied entirely from one station.

For an example of what was called the first or standard 500 volt continuous current system of distribution, a city may be cited in which the street railway lines radiate west from the center of the city like the spokes of a half wheel, with a radius of about five miles. Instead of having one large station at the hub of the wheel, the road is supplied with power from seven stations, distributed throughout the system, having an aggregate capacity of over 26,000 kilowatts.

The generating and distributing system in use in one of our most densely populated cities may be taken as an example of the way in which the system of distribution adopted is governed by conditions outside of those indicated for the most economical generation and distribution of power to the car motors. Although this system is compact and will probably require an average station output of over 30,000 kilowatts, which it would seem to the outside engineer could be more economically distributed and almost as economically generated at several stations, the street railway company is installing a high-tension alternating direct current system of distribution with a main station of 45,000 kilowatts ultimate capacity, and five rotary converter sub-stations of from 3,000 to 6,000 kilowatts capacity each. It is probable in this case that the location of the power station and the system of distribution was governed almost entirely by the great cost of real estate at points suitable for separate power stations.

It frequently happens that several miles distant from a street railway system much cheaper power is obtainable than at or near the center of the system. This may be due to an available water power, or to a difference in the cost of fuel, etc., at the two points. In cases of this kind the second, or what may be called the alternating direct current system, is usually the most applicable. To transmit power at 500 volts in any quantity from a distance of ten miles, or even less, is very expensive, owing to the large amount of copper required and the great loss. For instance, to deliver 500 amperes at ten miles distance will require about one hundred and fifty tons of copper, allowing a loss of about 30 per cent. in the line. This same amount of power could be transmitted at 5,000 volts by an alternating direct current system with about five tons of copper and with a loss of less than 10 per cent. in the line.

The weight of copper required to transmit power a given distance, other things being equal, is inversely as the square of the voltage, that is so say, if it takes 100 pounds of copper to transmit a certain amount of power a given distance at 500 volts, it will only take 25 pounds of copper to transmit the same amount of power the same distance with the same loss at 1,000 volts. It is owing to this fact that the alternating direct current system is so applicable where the power has to be transmitted for any considerable distance, as it allows of the use of very high voltages on the line, 10,000 volts or more being in general use, which by means of transformers and rotary converters can be reduced to 500 volts direct current for the trolley wire at points where the power is required. For an example of this system of distribution a street railway system may be cited which derives its power from a water fall. Here the power is generated at a pressure of 2,200 volts and is stepped up to 11,000 volts for the line. About 6,000 hp. is transmitted at this voltage for a distance of about twenty-one miles. The voltage is then reduced to 500 volts direct current, by means of static transformers and rotary converters at five sub-stations, located at or near the points where the power is required,

The third system mentioned, the "booster" system, is chiefly applicable on lines where there is a light average load, but where for short periods an extra heavy load has to be taken care of. It would seldom be economical to supply an entire road with power by means of a booster system, as the greater part

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of the power generated by the booster represents wasted energy, which is usually generated in an extravagant way, as the power required to drive the booster varies as the square of the current in the feeder, that is to say, if it requires 50 hp. to drive the booster with a load of 100 amperes, it will require 200 hp. to drive it if the load is increased to 200 amperes. Line losses which necessitate the continuous waste of more energy than could be compensated for by an ordinary compound wound railway generator are seldom economical, even on a portion of a system, but there are many cases where there is sufficient copper installed to take care of the average load economically, but where for a short time each day, or for a few weeks in the year, owing to local conditions, the traffic is very unusually heavy.

In cases like the above, where the heavy traffic is of short duration, a well designed booster system may save a large investment in copper at a total cost of much less than would be required to pay the interest on the copper investment. For an example of this method of distribution I might cite a street railway company which supplies power to its own lines by means of a standard 500 volt direct current system, and which also supplies power to a smaller road about thirteen miles distant by means of a three-phase alternating current system, using 5,500 volts on the line. Here the booster system is used in connection with the high tension system. When it becomes necessary to repair the high tension line, it was found expensive and inconvenient to do the work between the hours of 12:00 midnight and 4:00 A. M., the only time when the power was off, and as it was not considered safe to work on the line when it was in operation, a booster system was arranged to supply power to the distant road for short periods at times of light load. A 200 kilowatt booster was installed at the generating stations and was designed to raise the voltage one volt per ampere of current. Switches were installed at the sub-stations so that the high tension line could be connected directly with the 500 volt feeders, some 8 miles from the generating station, and the booster was arranged so that it could be readily connected to the high tension feeders.

When it was necessary to replace broken insulators or make other repairs on the line the attendants were notified at the generating station and at the sub-stations, and at a prearranged signal, made by varying the voltage on the line, the alternators were thrown out, and the booster thrown on in such a way that the power was only off from the trolley wire for a fraction of a minute. It was thus found quite practicable to make repairs on the line while the booster was in operation, and the system proved very satisfactory for supplying power at times of light load, while repairs were being made; the load on the booster frequently running as high as 500 amperes, at which time the voltage generated by the booster was about 500, which in addition to the 575 volts of the direct current system gave 1,075 volts at the generating end of the line; the voltage at the sub-station averaging about 450. While it would have been very expensive to run this booster for any great length of time, for the short time it was used the total cost was much less than the interest on the copper investment required to build a duplicate line.

The fourth system mentioned, or three-wire system, is most applicable to double track lines, where one trolley is made positive and the other negative, there being about 1,000 volts potential difference between the two, the current flowing from the positive trolley wire through the car motors to the rail and from the rail through the car motors and the other track to the negative trolley. The track is usually cross-bound and also connected to the conductor or connecting the two generators which are operated in series in the station. This connection with the track forms the third wire and tends to equalize the voltage should there be more cars on one side of the system than on the other. This method of distribution is usually capable of saving from 20 to 40 per cent. in copper, according to the character of the track return. If well balanced, it also greatly reduces the electrolytic action on buried conductors, such as water pipes, etc., and it is most applicable where there are excessive track losses with fair opportunities for a balanced load.

There are few roads in this country using the three-wire system of distribution, although it is used almost universally by lighting companies. This is probably due to the complications introduced in railway systems by the high voltage, usually about 1,000 volts, between the trolley wire and feeders on different sides of the system and the difficulty of balancing the load. The saving in copper, while not as great as in the three-wire lighting system, is still enough to warrant the extra complication, and under favorable conditions may prove very valuable.

I am only familiar with one example of this system of distribution. In this case there is very heavy traffic over a double track line to a park, about six miles from the power station. It was found impossible to handle the increased traffic on the ordinary 500 volt system with the existing feedwire. By re-insulating the line and operating it on the three-wire system, the efficiency of the distributing system was very much improved and they were enabled to easily handle the increased traffic with the existing feedwire.

The fifth system mentioned, or the alternating current system, is practically untried in this country. It seems peculiarly adapted to lines having long runs at uniform speed with few stops, such as lines connecting cities, rather than for ordinary street railway service. The alternating current motors at present in general use are of the polyphase type, and require at least three working conductors, which is a serious objection in many cases for railway work, as it necessitates the use of two trolley wires in addition to the track as conductors. The disadvantages of this system appear to be the necessity for at least two trolley wires and the probable difficulty in building alternating current motors suitable for railway work which will have a good power factor.

The main advantage of the alternating current system is the possibility of feeding lines with stationary transformers which need no supervision, but which can be considered simply as a part of the feeder, thereby multiplying many times the length of line which can economically be supplied with power from one station. The alternating current motor also has the advantage of running at fairly constant speed independent of the load. It will not race going down hill if the power is left on, but will return power to the line, nor will it slow down much in going up hill. There are four or five railway companies using this system, and judging from the reports that appear from time to time in the railway journals it is giving very satisfactory results.

The sixth system referred to, or storage battery system, is decidedly more expensive than the usual methods of electrical distribution owing to the great first cost and the short life of the batteries. Lead is at present the only metal capable of resisting the attacks of sulphuric acid, and modern batteries consist largely of lead, which is very undesirable from a mechanical point of view and is very heavy, so that unless the present type of storage battery is substantially improved, this system is only likely to be used where other systems are not practicable owing to peculiar local conditions or restrictions. The storage battery, however, has a large field in connection with the other systems of electrical distribution for street railways, and under favorable conditions may considerably increase the station capacity and reduce the fuel consumption; and when used on the line may greatly improve the regulation and increase the copper efficiency.

From this brief outline of the various systems it will be seen that each has its peculiar advantages and that no one is suitable under all conditions. It will generally be found that where the traffic is heavy and the distance short, the standard 500 volt system is most applicable. For suburban work, where the distances are greater and the traffic less congested or where it is necessary to transmit the power for some distance, the polyphase alternating direct current system will usually be found more economical. In special cases, where for short periods of time an unusually large amount of power is required, the "booster" system will often prove very valuable, while for high speed, long-distance, interurban work the three-phase alternating current system may be attractive. The cars on this system however, would have the great disadvantage of not being able to run over the ordinary direct current street railway lines.

There can be no general rule given that will determine the most advantageous system of distribution to use under the varying conditions to be met in street railway work. Each case must be considered as a separate problem and that method selected which will best meet the peculiar conditions involved.

SOME INTERESTING FAULTS MET WITH IN CABLE MANUFACTURE.*

BY J. WRIGHT.

A fault, whatever its nature, is at all times abhorrent to the electrician in charge of a network, but becomes more or less an object of interest when its position has been correctly localized, from the point of view indicated by cause, effect, and future prevention. In no branch of the profession are a greater variety of faults and their causes to be met with than in that of cable manufacture pure and simple; such faults arising, in process of manufacture from carelessness on the part of the operatives, inadaptability of machinery to a specific purpose, or other unforeseen circumstances.

It is with the object of interesting the reader, and at the same time exhibiting the difficulties which the much-maligned and long suffering manufacturer has perforce to contend with, that the following paragaphs have been written.

In rubber and gutta-percha insulated wires

*From the "Electrical Review," London.

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and cables, the faults most commonly met with are due to foreign matter and impurities in the insulating medium. Both rubber and gutta-percha, in the raw state, are essentially impure, owing to the local conditions governing their collection. For this reason they have perforce to undergo an exhaustive series of purifying processes before their final application to the cable or wire which they are intended to insulate, such as repeated washings in several waters, mastication, sieving through a gradually decreasing mesh, etc., but despite these precautions, impurities will often find their way into the final result with disastrous effect. Cleanliness and care are essential in cable manufacture; the presence of any foreign matter, especially in gutta-percha, will make itself evident in the final tests, however slight its proportion to the total mass of insulation. Such faults as these, due to impurities, are seldom found by inspection, to a rigorous system of which most core is subjected in its unfinished state, with the single exception of gutta-percha core, which, by its homogeneity of texture and monotone tint, readily lends itself to a minute visual inspection, which, with practice and experience as exemplified in some of the old hands to the trade, serves to

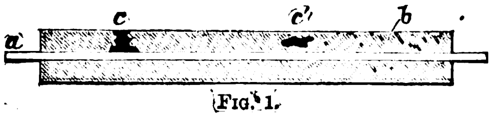

Fig. 1.

Fig. 2.

eradicate most of the faults due to this cause. The remainder have to be localized electrically to which end there are many systems, all more or less suitable according to local circumstances and which lend themselves, in the majority of cases, to actual spot localization.

Among the many impurities which find their way into rubber and gutta-percha compounds are wood, fiber, dirt, splinters of metal, mineral matter, etc., all of which, by their presence in the mass of the insulating sheath, tend to reduce its thickness, and, in many cases, form a direct conducting path from the conductor proper to the exterior of the core. The magnified appearance of a fault of this nature is represented in Fig. 1, where *a* is the conductor, *b* the insulation and *c* the impurity causing the fault. In the example shown, the foreign matter, such as a fragment of wood, for example, is represented as forming a direct path from the conductor. A less prominent case is denoted at c^1, where the impurity is totally imbedded in the insulating sheath; this would, in all probability, not become apparent as a decisive fault, but rather make itself felt in a local reduction of the insulation resistance, owing to the lesser thickness of the otherwise uniform insulating sheath.

Now, as to how these impurities find their way into the insulating medium:—Ordinary dirt and impurities may be generally accounted for by insufficient washing and mastication; but minute splinters of wood, for instance, may be accounted for in a different way. The rubber, previous to its application to the conductor, is in the form of rolls of sheet, mounted on a cylindrical wooden mandrel in a lathe, for the purpose of cutting it by means of a knife tool into rubber tape of varying widths, in which condition it is applied to the cable or wire; if the tool be advanced too deeply into the thickness of the roll its extremity reaches the wooden core, and in all probability cuts it slightly, the subsequent splinters, if the wood be soft, being commingled with the last layer of rubber. This cause of fault has been eradicated in many factories by making the cores of hard wood and dispensing with the final 6 inches, or so, of rubber tape, when running through the machine, an additional safeguard being provided in the shape of a stop to limit the depth of penetration of the cutting tool.

Fragments of metal, copper, tin, etc., are frequently separated from the conductor itself in the following manner: The smaller sizes of strands and single wires generally are covered with rubber by compression, i. e., the conductors, together with two strips of rubber one above and the other below, are passed between pairs of accurately turned hard steel rolls, which are grooved semi-circularly, such that at the point or line where they meet and revolve against one another, they form a complete circle equal in area to the cross-section of the finished or rubber-coated core. The seam or junction is secured to perfection by that property of freshly-cut rubber surfaces known as cohesion. Now, it is obvious that to secure centrality of the conductor it must pass absolutely through the center of the circle formed by the groove in two rolls; this is generally secured by passing it through frictionless guides, and also by maintaining the wire or strand taut between the limits of the machine by means of tension devices. Notwithstanding these precautions, it frequently happens in the case of stubborn wires or strands, such as 1/12 or 7/14 for example, that a slight kink in the bare conductor will pass between the rolls unnoticed, the existing tension being insufficient to straighten it. In a mild case, this usually results in throwing the conductor out of the center, as represented end-on in Fig. 2, such that the insulation is very thin on one side and correspondingly thick on the other, which has an obviously deleterious effect upon the ultimate insulation resistance of the core.

In extreme cases, however, as with a bad kink, the periphery of the conductor itself passes at one point between the contact surfaces of the rolls, and is squeezed out into a species of metal fin, surrounded on all sides by rubber, but usually with its extreme edge exposed, as represented in longitudinal section by Fig. 3, where *a* represents the conductor as before, *b* the insulation, and *c* the fault.

Fibrous impurities, such as cotton, jute, etc., frequently occur, and, absorbing moisture by capillary attraction, provide direct conducting paths from the conductor to the exterior.

Another frequent cause of fault is the cohesive seam before alluded to, which requires to be subjected to perfect compression by two meeting surfaces to ensure its satisfactory production. If the rolls by which it is produced be not accurately surfaced and re-turned from time to time, the wear and tear consequent on frequent and daily use causes them to become untrue, with the result that they do not actually meet, and the subsequent seam is in consequence imperfect, and tends to open again at that point instead of becoming, as in the case of a perfect seam, homogeneous with the remainder of the insulating sheathing.

This cause may be practically eliminated by systematic inspection and overhauling of rolls, as now adopted in the leading cable factories.

A very frequent cause of local weakness in insulation is the absence of pure rubber at certain points along the core. The pure rubber, which is the first coating applied to the conductor in vulcaized rubber-covered cables and wires, is, especially in the smaller sizes, responsible for a considerable percentage of the ultimate insulation resistance, and, if conspicuous by its absence, tends to lower the final megohmic result obtained. This absence of the coating is explained as follows: The pure rubber takes the form of a very thin coat applied spirally to the conductor under tension, i. e., it is stretched in position, each turn or lap overlapping the last by an amount sufficient to produce a perfect homogeneous joint by the aforementioned property of cohesion. If the rubber should give way at any point through inherent weakness or careless jointing, its natural elasticity causes it to run back for a short distance, and so leave the conductor exposed. A bare portion of the conductor exposed in this manner may pass over unnoticed by the attendant, and receive its subsequent coating of compound rubber, which hides the original fault until it is exposed by the subsequent electrical tests. For this reason, what is

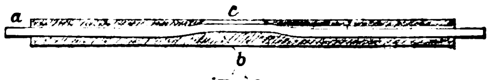

Fig. 3.

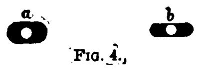

Fig. 4.

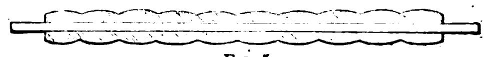

Fig. 5.

known as a "double lap" of pure rubber, though slightly more expensive in prime cost, gives much better results, in that any spaces left by the first coating are almost invariably covered by the second layer. This cause of fault has now been almost entirely removed by a rigid system of visual inspection of the unfinished core both entering and leaving the machine.

A very common manufacturing fault met with in vulcanized rubber-covered cables is that caused by a flattening of the insulating sheath due to excessive pressure while in a plastic state. Most compound rubbers before vulcanization are more or less of the consistency of putty, and, consequently, if subjected to any excessive weight or pressure, tend to flatten and lose their circular conformation. In order to undergo the process of vulcanization, the taped core is wound on cylindrical metal drums, which are then placed in the vulcanizing receiver. If an excessive length of core, running into several layers, be wound on these drums, the upper layers tend to press and contract on the underneath ones, thereby producing a flattening of the insulation, which —the rubber being then in a plastic state—becomes permanent, and, in extreme cases, causes the conductor to become exposed by sinkage through the surrounding rubber. Two faults of this description are represented in transverse section in Fig. 4, *a* being a mild case, and *b* an extreme one.

The taping, previous to vulcanization, is also frequently responsible for certain faults, of which the following are typical specimens: The "proofed" tape is applied spirally to the ruber-covered core under mild tension from a rapidly rotating "head." The tension is regulated by a nut and friction washer on the bobbin spindle; and if this be too tightly adjusted it causes the tape to draw in at its edges, and,

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by excessive pressure, cut into the surface of the plastic unvulcanized rubber, producing a fault, illustrated to a slightly magnified degree in longitudinal section by Fig. 5.

A second taping fault which the writer has met with was due to the jointing of the tape, where one bobbin ran out and another started. This jointing is sometimes effected by the application of a slight touch of pure rubber solution, or, in other cases, by hammering the two "proofed" surfaces together on a flat base, and trusting to cohesion to secure the joint. The fault under consideration was caused by the former method, in which a somewhat liquid solution had evidently been employed to excess; the overplus of naphtha, or other solvent, had in this case dissolved a large portion of the rubber immediately beneath the tape joint, and thereby pitted the insulation in such a manner as to render it defective. Similar faults were experienced in this particular length of core at almost every tape joint.

Another result of tight taping is what is technically known as "spewing" of the rubber, which consists in the plastic rubber forcing its way under pressure of the encircling tape

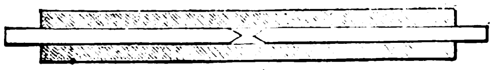

FIG. 6.

FIG. 7.

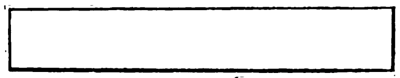

FIG. 8.

through the interstices of the fabric, and assuming a bead-like formation on the exterior surface of the core; in this manner the true thickness of the insulation is diminished, and its insulating qualities thereby impaired.

Broken wires and strands, especially in the smaller sizes, are a constantly recurring source of trouble in cable manufacture, mainly owing to the fact that almost all cable machinery is started and stopped on the "fast" and "loose" pulley system, a very erroneous one, under the circumstances, for this class of work. Almost all cable machinery, whether rubber-covering, taping, braiding, compounding, or armoring and serving, has a tension device of some kind, acting more or less directly on the cable attached to it, and the result of a sudden start on a hitherto stationary conductor can be better imagined than described. Numerous faults arise from this cause alone, large cables, having a conductor diameter of .5 inch or even more, being broken in this manner. In the case of small single wires, provided the shock be not very great, the broken extremities of the conductor are frequently held in intermittent contact by the inherent elasticity of the encircling rubber, which remains undamaged, thus giving greater trouble in localization. The sectional appearance of a fault of this description is represented by Fig. 6.

Breaks in small single wires are often the result of overheating or burning in jointing, the copper at that point being thereby rendered "short" or brittle. For a similar reason the use of an acid flux in soldering electrical conductors is tabooed, as the smallest trace of such a flux remaining on the finished joint will in time exercise a corrosive action on the metal thereof, tending in most cases to ultimate severance of the conductor, or, in any case, to the introduction of a high electrical resistance at that point.

Another form of fault which is occasionally met with in stranded conductors, especially when the conductor is of that particular quality technically known as "hard drawn," is that due to what is known as "bird caging," which consists in a general tendency on the part of the component wires to unstrand, causing them to bulge out of their normal position and engulf the surrounding insulation. The appearance of a normal and "bird-caged" strand of seven wires is represented in transverse section by *a* and *b*, Fig. 7.

Lead sheathing, which is so universally adopted as a mechanical protection for electric cables and wires, is responsible for several faults. In fiber-insulated cables, the imperviousness of the lead sheathing is the only guarantee of quality, in that a pinhole, extending through the thickness of the sheathing, will ultimately develop into a fault by the entry of moisture at that point. Such pinholes and flaws are frequently caused by the presence of minute quantities of red lead in the bulk of the metal, which passes through the press and ultimately presents the appearance of a small crack or flaw in the surface of the lead as represented in Fig. 8.

Other manufacturing faults in the lead sheathing process result from over-heating of the metal, etc., and frequently lead to the destruction of the actual insulating material while passing through the press.

The above-mentioned faults represent only a small percentage of the many which arise in process of cable manufacture, and are the result of observation on the part of the writer at some of the leading cable factories. They are in many cases responsible for the delay in execution and delivery of cable contracts, being, in the majority of cases, unforeseen, or due to carelessness on the part of the operatives. In some cases the fault lies with the customer, who, for the sake of a few shillings, will insist on a large single conductor or other erratic specification of his own personal conception instead of accepting the standard designs which have stood the test of time. In the writer's opinion 1/14 is the safe limit for a single conductor; after that size is passed, stranded conductors should invariably be employed; they are more flexible, easier to manipulate, and carry a more reliable guarantee of quality than a single conductor of equivalent cross section.

Bacterial Light.

Speaking of the uses which are now being found for various micro-organizms, the "Lancet" mentions as a thing to be cultivated that kind of bacteria which emits a phosphorescent light. The phosphorescent microbe, it states, if properly fed, will grow and multiply enormously, emitting during its development a strange phosphorescent light. In the past this light has been looked upon as indicating phosphorus in the neighborhood, but in a large number of cases it is not due to any chemical change, but to countless micro-organizms. In the case of the phosphorescence of the sea this is so, and in this case the phosphorescence is best when the sea is disturbed and the maximum of light is emitted from the crest of a short rapid wave, or in the foam produced by the water striking the shore.

DOUBLE TRUCK CARS—HOW TO CONSTRUCT AND EQUIP THEM TO OBTAIN MAXIMUM EFFICIENCY WITH MINIMUM COST OF MAINTENANCE.*

BY N. H. HEFT.

In order to prepare a paper which would be of any value to members of this Association, it was necessary to learn the conditions governing the operation of double truck cars on different systems. The conditions under which cars are operated vary to such an extent that it is impossible to construct and equip a car that can be operated with equal economy on each system.

In order to keep within the time allowed by the committee, and the more readily to convey to the members the writer's opinion as to the most desirable double truck car, the subject matter will be taken up under the following divisions: 1st, Trucks; 2d, Electric Motors; 3d, Double Truck Car Body and Equipment.

TRUCKS.

The double truck for use on street railways has not received the attention it merits. These trucks have been constructed along the lines of the single truck, and to meet the varied views of railway managements.

One has only to observe the different styles of trucks now in use to find how at variance have been their views.

The 55 years' experience of the steam railroad in the development of the double truck now used by them should be a warrant to the street railway managements in adopting only trucks that conform to the lines used by these roads; the diameter of wheels, with the tread and depth of flange should be changed only where conditions prevent using the Master Car Builders' standard.

The truck dealt with is a double truck, designed along steam railway lines to meet the varied condition of street railway service. In the plan of this truck, it has been the aim of the designer to include all known good features of the present street railway truck, and to add improvements of value. This truck is constructed with a minimum number of parts consistent with safety, strength, accessibility, lightness and cost of maintenance.

In giving a brief description of the truck referred to it will not be necessary to mention the wheels further than to say that they are cast chilled, 33 inches in diameter with a 3 inch tread, and 1 inch flange, formed to fit the modern rail, weight 380 pounds.

The axles are of forged steel, high in carbon, with a 2-inch hole bored through the entire length. The key seat at the gear wheel-fit is cut above the line of motor bearings and journals, in order not to weaken the axle.

The oil boxes are constructed so that the journal brasses may be readily removed with dust guard placed in position from the underside of box. An extra guard is placed from the same side and where it will retain the oil at the highest point.

The journal brasses and boxes are finished in such a manner as to obtain the full journal bearing under all conditions.

The side frames are made from two ⅝-inch steel plates, thus allowing the main equalizer to be supported between the two frames on long spiral springs. With this arrangement,

* Paper read before the Nineteenth Annual Meeting of the American Street Railway Association held at Kansas City, Mo., October 16-19, 1900.

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the bar can be removed for repairs without in any way taking the truck apart. This form of frame allows the greatest accessibility to all parts, and the use of the extended equalizer bars, gives extended spring movement, with a perfect slide movement on curves and at low places in the track, minimizing the blow to the car body, rail joints and special work and reducing the cost of maintenance of track and equipment. The side frame is so strongly constructed at points where the transom joins the frame that it is not necessary to continue frame around end and connect with the other side of frame to keep the truck in alignment. This also allows the placing of the truck near the end of the car body without coming in contact with the steps.

The brake is placed on the inside of the wheel, without using a brake beam. This position insures the most positive action, with either hand or power and independent braking on each wheel. The wheel base, 5 feet, 6 inches, allows the motors to be suspended between axles and transoms.

MOTORS.

The writer, having had experience with heavy and light motors, mounted with two motors on one truck, the other truck being an idle or trail truck, as well as with one motor on each truck, has found that, while greater efficiency is shown with the latter method, the two motors mounted on one truck, show a saving in labor, first cost of the trail truck, with less cost for maintenance.

Maximum efficiency, with minimum cost of maintenance, with both heavy and light motors has been obtained by mounting two motors on each truck, making a four motor equipment. With this form of equipment, higher speed and quicker acceleration are obtained with less power of consumption, both in the average and total for the whole trip.

After an experience extending from the time that the first railway motor was constructed, the writer knows of no mechanical apparatus in which the development has been so rapid and the point of perfection so nearly attained. Yet the future promises even greater development, both in the direct and alternating current motors. With the great corps of engineers employed by our large manufacturing concerns, working with the men who are operating these motors and constantly suggesting and demanding improvements, the ideal commercial car equipment will be developed.

The writer desires to call the attention of electrical and mechanical engineers to improving ventilation, increased copper, insulation, bearings, hollow armature shaft, decreased armature speed and gearless motors.

The controllers have not, as far as space and weight are concerned, kept pace with the motors. This part of the apparatus should receive the attention of the best talent of our manufacturing companies. The four motor controllers, in their present form, are large, cumbersome affairs, placed in that portion of the car body where it is inconvenient and expensive to support. A more satisfactory controller can be produced by using a small pilot controller placed on the platform, with some developed form of main controller underneath the car body.

DOUBLE TRUCK CARS AND EQUIPMENT.

From information furnished by operating department and personal observation, the writer is led to believe the following dimensions be most desirable: Length over all, 40 to 50 feet; width over all, 7 feet 6 inches to 8 feet 8 inches.

With the increasing demand from the traveling public for the extension of present systems to suburban districts with a more frequent service and increased speed, also the construction of long interurban lines, the present managements, to meet this demand are turning to the double truck car constructed along the lines of the steam railroad coach.

A double truck car the writer believes will become justly popular. This car combines the largest number of good features and is so constructed as to admit of placing the electrical equipment where it is accessible and less liable to come into contact with the truck or brake equipment.

The car body can be carried at the lowest point and the trucks placed near the end of the body. This car gives the maximum efficiency, durability, speed, safety, and seating capacity, attractiveness and ease and comfort to passengers, coupled with the minimum cost of construction and maintenance, and less dead weight per passenger, based on seating capacity.

The total weight is made up as follows:
Trucks, 3,970 pounds each.
Four motors, 2,385 pounds each.
Car body and equipment, 12,300 pounds.

Making a total weight of 29,780 pounds. This amount divided by 63 passengers gives a dead weight of 473 pounds per passenger. The cars of to-day show a dead weight, based on the seating capacity of full 750 to 1,100 pounds per passenger.

While the writer does not claim that the truck and car body described are perfect, yet he believes they are along lines that will become attractive to managers when taking up the cost of operation. Decreased cost of operation can only be obtained by purchasing equipments that are designed to perform a specific duty where all weights and speeds are known.

RAILWAY JOINTS AND TRACK.*

BY GEO. L. HALL.

Most managers of electric railway systems realize that good track is absolutely necessary. Not only is this fact forcibly illustrated by the increased wear and tear on the rails, joints, bonding, etc., where bad construction is used, but no small item is the damage to the rolling stock.

The best track that can be constructed is that which is absolutely free from any movements or impacts that can be prevented by the judicious use of the proper material and labor. Different conditions of heavy weights moving at high velocities must be dealt with, and any failure to provide accurate gauge, correct line and true surface will result in increased damage to both track and equipment. The structure must be adequate for the load and speed which it is expected to stand. The track is not primarily injured by the weight of the car, as weight in itself is an element of stability. Heavy weights moving at high speed striking irregularities of surface or line produce shocks and impacts which constantly multiply these defects and make the condition worse and worse. Therefore the management is justified in any additional outlay for labor and material that will reduce such irregularities in line or surface, and these facts should not be overlooked when considering first cost.

The general condition of track must not be judged altogether by how long it has been constructed or how lately worked over, but we must take into consideration the number of cars passing over, the kind of motive power used, and if in a city, the character of the street and street traffic.

There are many seemingly unimportant details that enter into the construction and maintenance of good track, and there is no part of a railway that requires more careful or painstaking observation and scientific methods of investigation in order to secure the desired results at a minimum cost. From experience the writer is of the opinion that too much attention cannot be given to accurate gauging. Many apparent imperfections in track are due entirely to irregularities of this kind. Especially is this the case on suburban lines and track constructed where there is no power to assist in holding it to line. No matter how true the surface and alignment may be, if the gauge is not accurate, poor riding track and more or less oscillation of the car will result.

As a rule, there are not many cross-overs or turnouts on electric railway lines, but a word about gauging at frogs would not be amiss. The proper alignment at such places is more important than it is generally considered to be. The practice of leaving the gauge a little wide at the frog-point should not be followed except where the conditions demand widening, and when such action is necessary the guard-rail distance should also be increased exactly as much as the gauge is widened. It is an error to suppose that the all-important point is to make the guard-rail distance exact, without regard as to whether or not the gauge is true. What should be kept in mind is the distance from the running-rail of the frog to that side of the guard-rail with which the wheel comes in contact. A frog may cause a noticeable lurch to the passing car when in exact position if the remainder of the track is too wide to gauge, either from its natural tendency to widen or from poor construction.

Some evidences of imperfect gauge are as follows: (1) When the frog receives a blow from the passing wheel or shows evidence of unnatural strain; (2) when near the end of the guard-rail there is an abrupt change from a badly-worn rail to a full head; (3) where there is a similar mark at either end of the frog; (4) when the guard-rail or the wing-rail of the frog is unnaturally worn and it is difficult to keep in proper position.

It is to be regretted that too often in the construction of electric railways it is necessary to close up the track before it is possible to work over the same after it has been in use for a short time. Especially does this refer to the surface and general condition of the joints. When the track material is new we have a solid riding surface, but this is largely due to the general strength and stiffness of the material. In a comparatively short time, varying with the traffic, the track does not ride as well as should be expected; the rails are slightly out of line and surface, the joints begin to bend, more or less play having developed; a tip appears near the rail end, and the joints are low. Without taking into consideration the damage to equipment and the use of labor which otherwise might be available for the constant improvement of the road, we are face to face with the question of repairs.

Theoretically and practically, everything that has to do with track work is subordinate to perfect line and surface. Work to exact

* Paper read before the Pennsylvania Street Railway Association, Oct. 10, 1900.

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gauge, perfect level and true line, with correct spiking, thorough tamping, good drainage and other details essential to their preservation and one will be surprised at the good results that will follow.

One of the most important details of track work is the rail-joint, and under average conditions it is the weakest part of track construction. The amount of wear at the joint naturally depends on traffic. Once the fastenings begin to show failure they grow rapidly worse, and while weak, are not necessarily dangerous, but they cause a rough riding track, increase the wear of the rails and damage the rolling stock. Much of the ultimate deterioration of joints could be avoided if there was not a general tendency to purchase cheap material and keep down the cost, and if angle-bars are used proper attention should be paid to their design and general efficiency, especially as to bearing area. A joint is simply a fastening that holds together horizontally and vertically the ends of the two rails. In addition to being held up, the rail must also be held down. This fact is apparent from the manner in which angle-bars break. Investigation shows that 90 per cent. of broken angle-bars break from the top down, this being caused by the leverage of the rail, the shoulder ties acting as a fulcrum. This action is augmented by the irregularities in the wave motion. The remaining 10 per cent. of broken angle bars have been broken from the bottom up by suddenly applied loads. In a perfect joint the construction must be such as to make the joint as strong and as stiff as the rail; at the same time the elasticity must be sufficient to carry the wave motion uniformly along the track and allow no permanent set or deflection to take place, the joint returning to its proper position after each passing load.

One great difficulty with the joint question has been to decide which is the best design, other conditions being equal. The original outline of the angle-bar, together with some combination giving base support and adding strength, has shown the best results.

If the rail and joint are of about equal strength and flexibility the wear on the ends of the rail is true, while if the joint is stronger than the rail the wave motion is broken, and the wear at the joint is irregular. If the fastening is weaker than the rail the joint will become dipped and rail and joint kinked and worn.

Due allowance must be made for expansion and contraction, taking into consideration the fact that calculation of expansion and contraction must be based on the temperature of the rail itself, and not the temperature of the air at the time the rail is laid. Too much opening between rail ends is necessarily bad, and causes pounding. At the same time the elastic limit will not take care of great expansion and contraction.

It is estimated that the loss of energy caused by the resistance to traction offered by low joints is 2 hp. hours per mile of track. In addition to this there is the loss by wear and tear on cars, track material, etc. Therefore any increased outlay necessary to secure a good joint is more than balanced by the saving in the cost of maintaining the track and equipment.

The new pattern making and cabinet shop in course of erection at Scranton, Pa., is nearly completed. The machinery will be operated by electricity, and several motors have been ordered. A new panel planer will also be installed.

LONDON NOTES.

[From our London Correspondent.]

The Institution of Electrical Engineers.

The customary summer vacation of the English scientific societies has come to an end, and arrangements are now in a forward state for the 1900-1901 session. So far as the Institution of Electrical Engineers is concerned it has sometimes occurred to us that the meetings might well commence at an earlier date than has been usual. For instance last year the presidential address to open the session came off somewhere about the middle of November. This year there is to be a slight improvement in this respect, for on November 8, Prof. John Perry, F.R.S., opens the proceedings with his presidential address, and the distribution of last session's awards. Toward the end of the session "extra" meetings have to be held presumably to work off the congestion of papers.

The general expression of opinion is that under the present secretarial management new life has been infused into the Institution. The week's convention in Switzerland in 1899 was an excellent new feature, and this year's meeting with American electrical engineers in Paris will be long remembered. Next year, if all goes well, members of the English Institution will be off to Germany to inspect the numerous electrical works which they are so often informed are miles ahead of English enterprise. One occasionally hears the complaint that electrical engineers are too busy making money to expend time and attention upon the preparation of papers; there are, however, always plenty of good practical papers forthcoming, the principal trouble being that they are too lengthy. Many of those read last session were large enough to make a medium sized volume. This of course means that the electrical engineering journals—which already experience difficulty in furnishing even a mere historical outline record of electrical development from week to week—cannot give the papers that extensive circulation that they merit. For some years past ELECTRICITY has endeavored to place the more practical papers before its readers in America, but last session while the papers were of great interest their length prevented full justice being done to them. It seems that it would be by no means a bad idea, if the Institution were to continue its progressive policy, by the preparation of abstracts, a plan which is followed out with success by Institutions of lesser importance. This appears to us to be the more necessary at the present juncture for this reason; instead of the meetings being held at only London and Manchester, they are now arranged for Glasgow, Dublin, Newcastle-on-Tyne, and shortly at Birmingham. All these are branches under the council of the London Institution of Electrical Engineers and different papers will be read at each and all excepting when the London paper happens to be of exceptional interest when it may be read at all sections, if the local committees approve. Each section has its local president and secretary, and of course its presidential address. Altogether the coming session of the electrical societies looks as though it will be a very good one. Mr. W. G. McMillan, the secretary, has proved that the council was right in selecting him for the appointment, although his predecessor, Mr. F. H. Webb, served the Institution well and faithfully for many years.

The Central London Railway.

The continued great rush for traffic on this underground railway at certain hours of the day may be imagined, when we mention that there is a suggestion that two "tubes" should have been laid down for the "up," and two for the "down" line traffic, instead of only one. Of course in this there is exaggeration, but it is a fact that there is a good deal of grumbling on the part of the public; because the accommodation is insufficient, and the discomfort is great. The superior popularity of the "Tuppenny Tube," as the public now term it, has cast the Metropolitan steam sewer lines quite into the shade. These railways did not feel the competition so keenly at first, and for a time it appeared that they would not suffer materially, but when the end of the quarter came and season-tickets fell in, many of them were not renewed. Hence the Metropolitan lines are now quite down in the dumps, and unless events move more rapidly than they have done previously, even electrical equipment may not save the sinking ship.

How the Central London authorities propose to meet the heavy traffic is not quite clear at present. We hear that a two and a half minute service is introduced and that longer trains are to be run. It is amusing to read the numerous letters which appear in the newspapers from day to day regarding this railway. Even the "Times," notwithstanding its sober sides, is allowing letter after letter to appear, showing that amateur railway managers are rife and that they don't know of what they talk. Among the remarkable suggestions which these wiseacres have made are: In the morning between 8 and 10 use both tunnels for "up" trains, and in the evening between 5 and 7 use both tunnels for the "down" service! This needs no laboring to show its sheer absurdity!

Again reduce the demand to the limit of the supply by increasing the fares from 2d. to 6d.! Some of us do not forget the grumblings at the City and South London Railway when it charged 3d. instead of 2d. at the heavy traffic hours. How the press yelled at the thought of the man who could only afford his 2d. going to the wall while the rich (!) 3d. fare "passed by on the other side"! Then some writers have tried to create a scare by saying: "Supposing that a train stopped in the middle of a tunnel and the lights went out what should we all do then, poor things?" Sir Benjamin Baker no sooner silences these qualmish questionings than others come along and ask a hundred things. Really, we are sorry for Mr. Cunningham and the Central London management if it has to give heed to all that is published in the newspapers about its "tuppenny tube."

The Belle Isle Telegraph Line.

The superintendent of the Canadian Government Telegraphs reports that telegraphic communication, all the way down the north shore of the St. Lawrence to Belle Isle, will be completed this fall, though it will not be possible to complete the cable over to Belle Isle, owing to the loss, recently, of the Government steamer Newfield. The cable will, however, be put down next spring, and, in the meantime, an arrangement has been made by the Minister of Marine with the English Lloyds by which the Government operator at Belle Isle will receive signaled reports from vessels inward and outward bound and transmit these reports to Lloyds' agent at the city of Quebec.

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CANADIAN NOTES.

(From our Ottawa Correspondent.)

Mr. G. A. Burgess of Carleton Place, Ont., is forming a company to engage in the electric lighting and power business in that town. It is proposed to utilize the water power at Arklan.

The town council of Brockville, Ont., has taken over the electric light plant from the Light & Power Company in that town, in accordance with a by-law passed a few weeks ago. The civic commissioners subsequently proceeded to Plattsburg, N. Y., to inspect the electric plant there before deciding upon what steps to take to place the Brockville plant in a perfect, up-to-date condition.

The Electrical Construction Company of London, Ont., is asking for tenders for the erection of a new factory. It is the intention to have a three-story building, 40 x 100 feet. This company from a small concern has risen to great proportions, and forms another important addition to the manufacturing interests of the city of London.

One of the greatest pieces of work seen in Ottawa for some time is that now being prosecuted by the Ottawa Electric Railway Company in the erection of its new arc light station. The rock cutting has already proceeded to some 35 feet below the level and will be taken out to a much lower depth. The work of construction of the building will not be commenced before next spring.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended October 24:

Antwerp, 1 case, $12; 9 packages, $726; Athens, 13 cases, $276; Berlin, 11 cases, $326; Bordeaux, 33 boxes motors, $3,000; Bradford, 1 box, $39; Brazil, 102 packages, $22,994; Bremen, 3 cases, $831; Bristol, 56 packages, $8,340; British Guiana, 38 cases, $1,907; British West Indies, 4 packages, $124; British Possessions in Africa, 65 packages telephone poles, $2,800; 4 cases, $1,101; British East Indies, 1 package, $25; Brussels, 16 packages, $1,419; Central America, 252 packages, $1,792; 1 case motors, $50; Cologne, 51 packages, $10,657; Copenhagen, 1 case, $48; Cuba, 124 packages, $5,143; 3 packages cable, $171; 10,058 packages electric railway material, $113,605; Dutch East Indies, 11 cases, $259; Ecuador, 1 case, $20; Florence, 3 cases, $1,500; French Possessions in Africa, 14 cases, $2,163; Genoa, 1 case, $2; Glasgow, 3 cases, $146; Greenock, 114 packages electric motors, $1,524; 80 cases, $1,280; Havre, 9 boxes, $5,250; 108 packages, $6,181; Hamburg, 88 cases, $13,050; 16 packages, $569; Leeds, 9 cases, $671; Liverpool, 82 packages, $13,051; 3 cases automobiles, $500; London, 53 packages, $11,676; 12 boxes, $850; Marseilles, 29 packages, $303; Mexico, 93 packages, $9,221; 1 case, $139; 4 cases automobiles, $5,583; Naples, 25 cases, $500; Newfoundland, 31 packages, $545; Newcastle, 17 packages motor machinery, $4,100; Nova Scotia, 22 packages, $304; Peru, 1 package, $5; Porto Rico, 226 packages, $672; Rostoff, 22 cases, $3,531; Southampton, 3 packages, $217; U. S. Colombia, 13 cases, $223; Venezuela, 271 packages, $1,402; Vienna, 42 cases, $7,097.

PERSONAL MENTION.

Donald J. Hutton of Schenectady, N. Y., who has been for several years employed by the General Electric Company, left recently for the City of Mexico, where he will be connected with the General Electric Company's plant in that city.

Mr. James J. Lawton of New Haven, Conn., was recently elected a director of the Enfield and Long Meadow Street Railroad Company, to fill the vacancy made by the death of the late Israel A. Kelsey.

Mr. Charles E. Carpenter of Bronxville, N. Y., has resigned the vice-presidency of the Ward Leonard Electric Company and will shortly engage in the business of manufacturing electric flat irons.

Mr. J. W. Holloway of Syracuse, O., has been chosen manager of the new plant of the Economy Electric Company in Warren, O.

Mr. John K. Pruyn, who died at his home in this city last week, was interested in many investment projects, among which were the Union Railway Company, the Troy City Railroad Company, and the Gas & Electric Works of Troy, N. Y.

Mr. Samuel Glover, president of the Post-Glover Electrical Company of Cincinnati, O., was severely injured by a fall a short time ago, from which serious results are feared.

INCORPORATIONS.

The Electric Carriage & Transfer Company, San Francisco, Cal. Capital stock, $250,000. Incorporators: Charles Montgomery, W. H. Jordan, George H. Montgomery, B. F. Riker and L. H. Johnson.

The Forest City Incandescent Mantle Company, Cleveland, O. Capital stock, $10,000.

The Crocker-Wheeler Electric Company, New York City. Capital stock, $1,000,000. Incorporators: Frank M. Jeffery, William H. Geers, Gano S. Dunn, Henry H. Crocker and Augustus K. Sloan.

The Ripon, Dartford & Green Lake Traction & Light Company, Madison, Wis.—to operate an electric road between the points named and furnish light. Capital stock, $100,000. Incorporators: J. S. Roundtree, O. Schallum and H. P Cody.

The Missouri River Power Company, Jersey City, N. J.—to manufacture electricity, etc. Capital stock, $2,000,000. Incorporators: Samuel T. Hauser, Barton Sewell and Henry Suhr.

The Hughes Light & Heating Company, Pittsburg, Pa—to deal in gas and electrical appliances. Capital stock, $100,000. Incorporators: W. G. Hughes, J. O. Kiskaddow, G. W. Gilmore, J. Armstrong, all of Pittsburg, and J. P. Appleman of Allegheny.

The Canadian Churchmont Motor Company, Wilmington, Del. Capital stock, $500,000.

The Ithaca Electric Company, Ithaca, N. Y.—to manufacture electricity for light, heat and power. Capital stock, $50,000. Directors: Herman Bergholtz, D. M. Dean, Ithaca, and W. K. Turner, Philadelphia.

The American Institute of Electro-Therapeutics, New York City. Capital stock, $5,000. Directors: S. G. Tracy, W. H. McIntosh and E. E. Black, New York City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED OCTOBER 23, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

660,487. Electric Brake. Frank E. Case, Schenectady, N Y., assignor to the General Electric Company of New York. Filed Aug. 5, 1898.

660,502. System of Motor Control. Alexander S. Garfield, Paris, France, assignor to the General Electric Company of New York. Filed March 11, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

660,154. Receptacle for Incandescent Lamps. Philip H. Fielding, New York City. Filed April 2, 1900.

660,271. Insulating Knob for Electric-Light Wiring. Robert H. Henderson and John G. Henderson, Chicago, Ill. Filed Dec. 10, 1897.

660,393. Electric-Arc Lamp. John J. Rathbone, London, Eng., assignor of two-thirds to Eric Rivers Smith and Charles Bean King, Jr., same place. Filed Feb. 24, 1900.

660,475. Manufacture of Incandescing Electric Lamps. William L. Voelker, London, Eng., assignor to Theron Clark Crawford, New York City. Filed Nov. 20, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

660,217. Electric-Motor Wheel. Charles E. Isbills, Passaic, N. J. Filed Dec. 13, 1899.

660,263. Electric Linotype-Machine. Alfred W. Storm, Ramsey, N. J. Filed Sept. 22, 1897.

660,459. Slot-Wedge for Dynamo-Electric Machines. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 21, 1900.

660,534. Regulating Dynamo-Electric Machines. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 18, 1899.

660,539. Coin-Controlled Electric-Shock Machine. Bethuel M. Davis, Chicago Ill., assignor to the Advance Machine Company, same place. Filed Feb. 12, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

660,124. Telephone System. Lambert Schmidt, Weehawken, N. J. Filed March 8, 1900.

MISCELLANEOUS.

660,113. Panel-Board and Fuse Holder. Charles J. Klein, New York City, assignor to the General Incandescent Arc Light Company, same place. Filed March 14, 1900.

660,134. Automatic Circuit Breaker and Closer. William B. Watzel and Forest L. Shekell, Washington, D. C. Filed Jan. 4, 1900.

660,138-660,139. Thermo-Electric Cell. Ernest F. Yost and William H. Smith, New York City. Filed June 28, 1900.

660,140. Insulator. Cassius Alley, Pendleton, Ind., assignor of one-third to Charles Henry Miller and Henry Wagner, Anderson, Ind. Filed April 9, 1900.

660,152. Electric Welding Tongs. John R. Duncan, Indianapolis, Ind., assignor of five-eighths to Calvin F. Darnell and C. Augustus Schmidt, same place. Filed May 17, 1900.

660,155. Apparatus for Controlling Mechanism of Moving Vessels or Vehicles. Bradley A. Fiske, U. S. Navy, assignor to the Western Electric Company, Chicago, Ill, Filed Sept. 7, 1898.

660,156. Method of Controlling Moving Vessels or Vehicles. Bradley A. Fiske, U. S. Navy, assignor to the Western Electric Company, Chicago, Ill. Original application filed Sept. 7, 1898. Divided and this application filed April 2, 1900.

660,199. Telautograph or Facsimile-Telegraph. Anton Pollak, Szentes, Austria-Hungary, assignor of one-half to Friedrich Silberstein, Vienna, Austria-Hungary. Filed May 25, 1898.

660,228. Plate or Element for Storage Batteries. Elmer A. Sperry, Cleveland, O. Filed March 24, 1900.

660,275. Phonograph Sound-Box. Frederick Myers, New York City, assignor, by direct and mesne assignments, to the Stylo-phone Company, same place. Filed March 22, 1900.

660,293. Electric Meter. Thomas A. Edison, Llewellyn Park, N. J. Filed Sept. 16, 1899.

660,305. Thermo-Electric Battery. Jesse Oliver, Memphis, Tenn., assignor to Thomas B. Turley and West J. Crawford, trustees, same place. Filed Feb. 8, 1900.

660,320. System of Electrical Distribution. Charles I. Young, Philadelphia, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed March 6, 1900.

660,340. Safety Cut-Out for Electric Circuits. Joseph Sachs, Hartford, Conn. Filed July 10, 1899.

660,352. Electric Temperature-Indicator. Leslie S. Wilder, Springfield, Mass. Filed Feb. 17, 1900.

660,375. Electric Battery. Frank K. Irving, Newark, N. J., assignor of one-half to Andrew G. Vogt, same place. Filed March 19, 1900.

660,385. Self-Winding Electric Clock. Augustine J. Madden, Prahran, Victoria. Filed Dec. 23, 1899.

660,396. Electric Regulator. Charles W. Richards, Needham, Mass., assignor of one-half to Winthrop M. Chapman, same place. Filed Aug. 21, 1899.

660,416. Manufacture of Reflectors. Sherard O. Cowper-Coles, London, Eng., assignor of one-half to the Reflector Syndicate, Limited, same place. Filed Nov. 7, 1898.

660,469. Signaling System. Edward J. Silkman, Baltimore, Md., assignor of one-third to Charles Selden and Edgar Wesley Day, same place. Filed March 25, 1898. Renewed Aug. 6, 1900.

660,483. Transmission of Power. Ernst J. Berg, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 16, 1899.

REISSUE.

11,865. Method of Insulating Electric Conductors. Nikola Tesla, New York City. Filed Sept. 21, 1900. Original No. 655,838, dated Aug. 14, 1900.

DESIGN.

33,430. Electric-Arc-Lamp Casing. Edward H. Belden, Fort Wayne, Ind. Filed Aug. 13, 1900. Term of patent 14 years.

The Electrical Construction Company of London, Ont., Limited, is asking for tenders for the erection of a new factory. It is the intention to have a three-story building 40 by 100 feet. The Electrical Construction Company from a small concern has risen to great proportions. This will be another addition to the manufacturing interests of that city, as the increase in its business will without doubt demand more help.

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THE TELEPHONE WORLD.

American Telephone & Telegraph Company.

There have been conferences in Boston of late between the American Telephone & Telegraph people and the presidents of the following companies:

James E. Caldwell, president Cumberland Telephone Company; George N. Stone, president Bell Telephone Company of Cincinnati; Chas. J. Glidden, president Erie Telephone system; John I. Sabin, president Pacific States Telephone Company; Chas. F. Sise, president Bell Telephone Company of Canada; George Y. Wallace, president Rocky Mountain Bell Telephone Company; Wm. A. Jackson, president Central Union Telephone Company.

The above represent companies operating over 300,000 telephone subscribers for fully 50 per cent. of the Bell system in the United States and all of the Canadian system.

Now that the American Telephone & Telegraph Company has moved to New York, there is every reason to believe that a practical New York telephone man will succeed to the presidency of the parent company, and Mr. Chas. F. Cutler, president of the New York Telephone Company and a director in several of the Bell subsidiary companies, is prominently mentioned in telephone circles for that office. Mr. Cutler has been connected with the telephone business for over twenty-two years, was formerly a resident of South Framingham, but has lived many years in New York and is considered by all telephone men as one of the ablest managers in the country.

The Chicago Telephone Company's reduction of rates, which has lately been announced, applies only to such limited conditions as to make no very material change in the previous basis. Some nickel-in-the slot telephones have been put in where there are ten 'phones to one wire, and under these circumstances a five cent rate is in force. This only applies to the residence districts and was intended to give a limited service at a cheap rate to a number of small subscribers. Not a single public pay station in the city has been put on the five-cent toll scale, and the company says that none will be. The ten-cent rate in force in this city is said by the telephone men in Chicago to be the lowest possible under existing conditions for cities of such large size. There are 75,000 telephones in the New York system. In Chicago there are only about 20,000.

It is learned that the American District Telegraph Company is considering the installation of a telephone service as an adjunct of its messenger business. It is experimenting with a telephonic device called the audiphone, now in use in Chicago. The audiphone, if adopted in New York, will be used for telephoning for messengers to be dispatched with oral messenges, it is said, but the American District Telegraphic call boxes would continue to be used for calling boys for carrying parcels and notes. This contemplated move of the American District Telegraph Company, it is said in Wall Street, is the basis for the rumor that the American Telephone & Telegraph Company is about to institute a messenger service.

The Sunset Telephone Company is going to rebuild the system between Redding and Weaverville, Cal., Keswick and Shasta, will also have separate lines. At present the two towns are on the Redding-Weaverville line. The business justifies a separate line for them and a loop will be strung. The poles now in use will be used, and the expense of the new modern line will not be very great. It will improve the service very much.

The Kansas City Telephone Manufacturing Company has lately closed a contract with Mr. S. F. Cunningham, representing the Norborne Telephone Company of Norborne, Mo., for a complete system for that city. A Eureka metallic express switchboard of 100 capacity will be used. The instruments are the Kansas City Telephone Manufacturing Company's best make and when finished this will be one of the finest and most modern exchanges in that State.

A special committee of citizens and aldermen of Jackson Mich., met with J. F. Land and W. E. Thompson, of Detroit, Mich., representatives of the Michigan Telephone Company, with reference to improving the local service. The telephone company wishes to put in a system of conduits which, it is claimed, is necessary for better service. A new switchboard is also promised. A special meting of the council has been called to consider a formal proposition of the telephone company.

A charter was issued last week to the Carbon County Telephone & Telegraph Company of Mauch Chunk, Pa., with a capital of $30,000.

The poles for the new telephone line to the "Shakers" are nearly all set up. This is part of the local line that runs to the station at East Gray and New Gloucester, Me.

Telephone Company Seeks Franchise in Chicago.

The United Telephone, Telegraph & Electric Company, an independent organization operating more or less in the Mississippi Valley, has applied to the city council of Chicago for a franchise to operate a telephone system in that city. The company has a franchise in Hyde Park, now a part of Chicago. This was obtained in 1898, when the Hyde Park District Telephone Company was formed to provide a telephone service in competition with the Bell. That company's franchise was bought by the United Telephone, Telegraph & Electric Company in 1894.

The company now announces its intention to lay its conduits downtown in the business quarter of the city, and will charge $85 for a business telephone, and $50 for a house telephone for unlimited service.

In return for the franchise it will pay the city 3 per cent. of its gross earnings, the first five years, 5 per cent. the next ten years, and 7 per cent. the next ten years. It also agrees to have 2,000 telephones within the first ten years or forfeit its plant and franchise. These propositions are embodied in the ordinance presented to the city council.

The new move on the part of the United Telephone, Telegraph & Electric Company is said to be due to the recent change in the ownership of the company. About a month ago Willard T. Black acquired a large block of the stock and was elected president to represent the new interest. The company claims to have 500 subscribers, but they are confined to the Hyde Park district. There is not much chance for expansion in that district, and unless a franchise is granted the plans for a long distance service between Hammond, Ind., and Chicago will be abandoned.

A recent meeting of telephone men in Marion, Ind., discussed the proposed consolidation of the various independent telephone companies north of Indianapolis. It is said an offer was made for the local plant, and, if bought, $18,000 will be spent to improve it. Among those present were Hugh Daugherty, L. C. Davenport, F. C. Oppenheimer and James B. Sale, Bluffton; John W. Sale, Ft. Wayne; H. L. Sale, Indianapolis. The Bluffton parties and John W. Sale represented the United Telephone Company, which controls the independent systems of Huntington, Portland and Bluffton, Ind.

The people of Dauphin County, says the Harrisburg, Pa., "Independent," are charged enormous tolls by the Bell Telephone monopoly for messages sent from one point in the county to another. The Court House ring have prevented a free county service to users of telephones by "persuading" select council to defeat the independent telephone ordinance. This is another instance in which the people of Dauphin County lose enormously by keeping the ring in power.

The directors of the Tidewater Telephone Company met at Gloucester C. H., Va., a short time ago. W. W. Fields, assistant superintendent, was elected manager of the Saluda exchange, which will be open soon with about forty 'phones. The issue of five hundred dollars' worth of additional stock was authorized to cover the increased cost of the Tappahannock, Va., line.

The decision of the Supreme Court, deciding section 3,461, Revised Statutes, unconstitutional, will stop contemplated proceedings in Millersburg, O., by telephone companies to get a franchise through the Probate Court, having failed to get it from the council, and they will now make another effort in the council to get into town.

The Iowa Telephone Company is said to have almost closed a deal whereby it becomes the owner of the Central system which has lines as far northeast as Baxter and also to Ames. The lines of this system go also to Newton and Oskaloosa. The Central has been one of the independent systems entering Des Moines.

A stock company has recently been formed in Tyndall, S. D., for the purpose of putting in a local telephone exchange. It will be in working order very soon.

A telephone line will soon be built from Mountain City to Shady, Tenn., a distance of twelve miles. When this line is completed the entire county will be very well connected.

The Blue Earth Telephone Company of Blue Earth City, Minn., is at present, with a large force, remodeling its entire plant and wiring in that city, at an expense of about $3,000.

The contract has been let for the building of the proposed telephone exchange in Villa Rica, Ga.

Independent 'Phones for Greeley, Col.

The Greeley Independent Telephone Company is now assured. The Bell telephone will have competition throughout Colorado, if the plans of the Independent Company are carried out.

Not long ago the city council of Greeley granted the Independent Company a franchise to erect poles, string wires and conduct an exchange. This was done in the face of strong opposition on the part of the Bell Company.

The people of Weld County have felt the need of a new telephone system for a long time, and when the local company was formed expected that it would be supported by the entire community, but strong opposition arose, and six months' delay ensued before the right to put in an exchange was granted.

It is proposed to put telephone exchanges in all the towns in the vicinity of Greeley, and then to extend the system over the State as rapidly as possible. It is believed by the promoters that the growth will be phenomenal, as the company is backed with abundant capital, and has means of obtaining the most improved appliances, and does not demand so high a rate of interest on money invested, and carries no watered stock for patrons to pay dividends on. The rate charged for telephones is to be about one half that demanded by the Bell Company.

Independent companies have been established all over the United States during the past five years, and in nearly every instance have proven beneficial to the public. The service has invariably been bettered, as the lowering of prices has resulted in the use af a much larger number of 'phones.

The Clay Telephone Company has held a conference with its attorneys, James Gay Gordon and George S. Graham and decided to sue the city of Philadelphia and the Keystone Telephone Company, charging that a franchise granted them by councils was illegally revoked. The amount of damage to be asked is nearly $1,000,000, it is reported. This claim is made on the ground that the city has had the use for the past decade of 300 miles of poles and wires, which the Clay Company erected and never used for its own profit. When the company first put up the wires and poles an injunction was issued against it by the Bell Telephone Company, and it was forced to let them stand idle until the patents of the Bell Company expired. Then a franchise was secured from councils and shortly afterward repealed, when the Keystone deal was made.

A. H. Springer of the Pacific States Telephone Company has commenced the construction of a branch line from Stevenson, Wash., to connect with the line on the Oregon side. The line will run from Stevenson to the Cascades, where it will cross the Columbia River. Stevenson has hitherto been without telegraph or telephone communication.

The Pacific States Telephone Company has completed a heavy copper loop between Portland and Astoria, Ore., also another between Portland and Tillamook, Ore., which enables both of these places to talk satisfactorily to San Francisco and other distant points.

It is stated that the Southwestern Telephone & Telegraph Company will make no charge for local exchange service in Galveston, Tex., until December 1 to subscribers who will agree to continue service for a period of six months from that date.

The Massachusetts Telephone & Telegraph Company, says the Boston "Post," expects to be operating its first switchboard December 15 with 1,800 connected subscribers.

A trench has lately been dug along the north side of the Boulevard in Arverne, N. Y., to receive the conduit for the wires of the New York & New Jersey Telephone Company.

The Gainesboro Telephone Company of Crossville, Tenn., is putting up a copper wire to Rockwood and also putting in a number of local telephones along the line.

Early next spring the Vernon & Nelson Telephone Company will build a direct telephone line from Rossland, B. C., to Cascade.

TELEPHONE INCORPORATIONS.

The Extension Telephone Company, Conejos, Col.—to erect or purchase telephone lines in Conejos County. Capital stock, $5,000. Incorporators: Jose A. Garcia, H. H. Russell and F. Warshaur.

The Queen City Telephone Company, St. Louis, Mo.—to construct and operate telephone lines. Capital stock, $50,000. Incorporators: C. G. Chaddock, F. A. Churchill, H. M. Dix, G. R. Henderson, all of St. Louis; G. Chaddock, of Los Angeles.

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GENERAL ELECTRICAL NEWS.

Lighting.

Bakersfield, Cal.—An electric lighting plant will soon be erected by the West Shore Company.

Burton, Wash.—An electric light plant will be erected here for Vashon College. Address President Jones.

Columbia, B. C.—This city is preparing to establish an electric light plant. J. A. McCallum, city clerk.

Eagle's Mere, Pa.—A party of capitalists including H. Lausatt Geyelin, of Philadelphia; C. Larus Munson, J. R. T. Ryan and William Emery, of Williamsport, are interested in a project to establish electric light and water plants here.

Gurdon, Ark.—The Gurdon Mill & Gin Company recently incorporated with $5,000 capital stock, of which E. A. Whitman is president, will in the near future erect an electric light plant.

Hartford, Mich.—This place is to have electric lights for the streets.

Hammondsport, N. Y.—Arrangements are being made to light many of the business places here with electricity.

Ithaca, N. Y.—H. Bergholtz has applied to the city council for a franchise to erect an electric light plant.

Kasson, Minn.—Plans are being prepared for a $5,000 electric light plant here to replace the one destroyed by fire some weeks ago.

Kirkwood, Mo.—At a recent meeting of the board of aldermen the St. Louis Electrical Supply Company was awarded the contract for furnishing the municipal electric lighting plant for this place.

Laurel, La.—At a meeting of the mayor and board of aldermen, held recently, F. W. Pettibone was authorized and granted the right of the streets and sidewalks for constructing and operating an electric light and power plant.

Lewiston, Pa.—The council will receive bids until November 5 for lighting the streets with 30 or more arc lights of 2,000 candle power.

Mantorville, Minn.—C. S. Wedge & Sons, owners of the Mantorville Roller Mills, will install an electric light plant to light this city.

Middleport, N. Y.—The question of erecting an electric lighting plant, to be owned and controlled by this village, is agitating the municipality at present. A committee, consisting of C. H. Cramer, chairman, has been appointed to visit villages owning their own plants, and ascertain the advisability of recommending to the taxpayers a like ownership.

Middletown, N. Y.—W. J. Hinchey is interested in the electric light question that is being agitated here.

Newman Grove, Neb.—The citizens of this place are agitating the question of erecting an electric light plant.

Northport, N. Y.—The Northport Electric Light Company has contracted to furnish lights to the Carmandale stock farm, on the road from Centerport to Huntington.

Norwich, N. Y.—E. F. Murray of Troy and L. W. Emerson of Warrensburg, owners of the Norwich electric light and gas plants, have decided upon some necessary improvements in their property.

Petersburg, Va.—A stock company will doubtless soon be organized here for the purpose of establishing a new electric light plant. It is believed that the demand for a first-class electric light plant fully justifies the prospective enterprise.

Richmond, Tex.—There is some talk of the electric light plant being placed in running order in the near future.

Ripon, Wis.—Bids are asked until January 3 for privileges and franchises for supplying electric light for this city. Propositions may be for five, ten or fifteen years. Address F. W. Allen, city clerk.

Spokane, Wash—The Washington Water Power Company has made another reduction in the cost of electric lighting. The change will go into effect on all bills rendered after November 1.

Wilton, N. D.—Wilton will soon be lighted by electricity from a plant located at the new coal mine owned by W. D. Washburn.

Windsor, Conn.—The prospects of having an electric lighting system here are now quite promising.

Street Railways.

Albany, N. Y.—The owners of the Albany Street Railway system contemplate putting in an electric line in place of the steam power now in use.

Battle Creek, Mich.—The post office department has awarded a contract to the Battle Creek-Kalamazoo Electric Road to carry mail on Sundays between the two cities for villages on the line.

Delaware City, Del.—It is rumored that a trolley road is to be built from here to Augustine Park, crossing the canai over an iron bridge to be built.

Elkton, Md.—Messrs. P. M. O'Brien, T. F. Deegan and Capt. Higgins, capitalists, have subscribed to the whole of the capital stock of the Cherry Hill, Elkton & Chesapeake City Electric Railway, and construction of the road will begin soon.

Fairmont, W. Va.—The stockholders of the Fairmont & Clarksburg Electric Railway met last week and elected the following directors: J. N. Camden, S. D. Camden and I. Davis, of Parkersburg, and others. The purpose of the company is to build an electric passenger railroad from Clarksburg to this city, through the Camden coal fields.

Grass Lake, Mich.—W. A. Boland has secured franchises for his electric road from the authorities of both Dexter and Ann Arbor. Mr. Boland will extend his road from the latter city to Detroit via Plymouth. Work has commenced on the line between this place and Jackson.

Lancaster, Pa.—The building of an electric railway from this city to Manheim is contemplated by local capitalists.

Lima, O.—The Western Ohio Electric Railway Company has been incorporated with $1,000,000 capital stock. The company will soon begin to build a line from this city to Wapakoneta and St. Marys.

Marietta, O.—Col. E. A. Boone is here securing the right of way for an electric railway from Zanesville and Parkersburg.

Media, Pa.—An electric line from here to Geneva, O., is projected. The distance is 48 miles.

Middletown, Conn.—There is again strong talk of equipping the Middletown, Meriden & Waterbury road with the third rail electric system.

Newport News, Va.—The city council lately granted a franchise to the Hampton Roads Railway & Electric Company to operate a street railway within the city limits. This railway company proposes to build a road from here through Hampton to Old Point.

Oklahoma, Okla.—A charter was lately issued for the Sulphur Springs Electric Railway Company with headquarters in this city and branch offices at South McAlester and other points. The road will cost $250,000 and will be 24 miles long.

Parkersburg, W. Va.—A company has been formed to build a trolley line from here to Marietta, O. The road will be constructed within a year and will make tributary to Parkersburg all the towns about the city for 12 miles. H. C. Henderson is president of the pany.

Pontiac, Mich.—A company of Eastern capitalists has been organized to take control of the Pontiac-Flint Electric Railway. The plan is to build a double track line from Detroit to Bay City.

Selma, Ala.—It is thought that by February 1 the electric car system will be completed.

South Haven, Mich.—John J. Sturm of Chicago has presented a petition to the council of this city asking for a franchise to build an electric railroad from here to Paw Paw Lake.

Company Matters.

Millbury, Mass.—The Millbury Electric Company lately elected these officers: Treasurer, Herbert A. Ryan; clerk, J. H. Searles; directors: Thomas Robinson of Dedham, George Smith, of Boston, P. W. Wood and J. H. Searles, of Worcester, and Herbert Ryan, of this city.

Reading, Pa.—The Metropolitan Electric Company is about to sink an artesian well. The object is for emergency purposes, so that in the event of an accident to the city supply the company will have another source to fall back on.

Sharon, Pa.—Representatives of the New York Trust Company purchased the Shenango Valley Electric Light plant here October 25, and also the Sharpsville Electric Light Works. The company will build electric railroads connecting Sharon, New Castle and Youngstown, and will invest over $2,000,000 in the towns above mentioned.

Manufacturing.

Dover, Del.—A recently incorporated concern, known as the National Pianist Corporation, has been formed here for the purpose of manufacturing mechanical piano players by air or electricity with a capital stock of $250,000.

Hamilton, Ont.—The management of the Ontario Lantern Company has closed a deal with the Shelby Electric Company of Shelby, O., for the exclusive rights to manufacture and sell the Shelby incandescent electric lamp in Canada and for export.

Washington, Pa.—The instruments for the electrical clock system, invented by A. French Poole of this place, are to be manufactured on a large scale at Wheeling.

Power and Transmission.

Cornwall, Ont.—The Shieks Island dam, at the foot of the Longue Sault Rapids, ten miles west of here, is to be used for electrical generation, which will transform the hitherto wasted energy into power that will light the Cornwall Canal and drive a good deal of the machinery in Cornwall that is now operated by steam

Haverstraw, N. Y.—The Buttermilk Falls Electric Company, with which Hon. W. C. Anthony of this city is associated, has purchased the Fort Montgomery mill property, which includes the entire water rights of the Popolopens Creek, supplied by Popole, Cranberry and Long Ponds. A new plant will be constructed, which will include a dam for storing water, a 150 horse power boiler and engine, and a new 2,000 volt alternating current dynamo of the latest type, made by the Stanley Electric Company.

Hot Springs, Ark.—James P. Turner of Chicago, has lately been here conferring with local capitalists regarding the establishment of an electric power plant on the Ouachita River, eight miles from this city.

Sacramento, Cal.—The Central California Electric Company, which has one of the largest power houses in the State, from which light and power is transmitted from Newcastle to this city, has decided to increase the capacity of its plant.

Automobiles.

Hartford, Conn.—The machinery in the factory of the Worcester Cycle Company will be turned over with the buildings by the American Surety Company to the New York Motor Vehicle Company. The machinery will be valuable in the manufacture of automobiles which will be commenced here shortly; the factory is already partly equipped.

Minneapolis, Minn.—The Blood-Mille Motor Vehicle Company has been formed here with a capital of $500,000. The concern will manufacture and deal in automobiles. Joseph W. Blood, Otto E. Mille and Bernard Tuchman, are all interested in the firm.

New Albany, Ind.—The Louisville Automobile Cab Company has been organized here lately, with a capital stock of $25 000. Among those interested are Peter Arund, James A. Windsor, Jr., William H. Sturvant, Clarence Dallam and George H. Hester.

San Francisco, Cal.—The California Automobile Company was recently incorporated here by Henry C. Whittemore, Michael J. Kirwin, Charles E. Hancock, Sherwood Bird and Norton C. Hulse, with a capital of $150,000.

St. Louis, Mo.—C. R. Drummond, C S. Scott and W. D. Pittman are interested in a newly-formed concern known as the Scott Automobile Company of this city, capitalized at $30,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.–Oct 29.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1½ % Q.,	114	115
Allentown Pa.–Oct 29						
Allentown & Lehigh Val. Trac. Co	..	4,000,000	1,500,000	....	--	15
Bridgeport, Conn–Oct 29:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md–Oct 29:						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.–Oct 29:						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156	158
Brooklyn N. Y.–Oct 29:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	229	231
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	60¾	60⅞
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	257	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.–Oct 29.						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.–Oct 29						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	87	90
Charleston, S. C.–Oct 29						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.–Oct 29						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	250	255
Chicago & South Side R. T. RR	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	33	33⅛
Met. West Side El., pfd	100	15,000,000	9,000,000	....	82	82¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	13,189,000	1½ % Q., Feb.	99	99⅛
Union Traction Ry..........com.	....	1,250,000	624,900	35 %	12½	13½
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	47¾	48
Cincinnati, Ohio.–Oct 29:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.–Oct 29:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.–Oct 29						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.–Oct 29.						
City Railway Co..............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.–Oct 29						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.–Oct 29						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.–Oct 29.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind–Oct 29.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	15	18
Lancaster, Pa.–Oct 29						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.–Oct 29:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry.....................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.–Oct 29						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63⅜	63½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct,	136	137
Montreal, Canada.–Oct 29						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	267	297¼
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J.	†100¾	109½
Memphis Tenn.–Oct 2:						
Memphis Street Railway Co	100	500,000	500,000	....	25	-
New Haven, Conn.–Oct 29:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	-
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.–Oct 29						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York–Oct 29:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	158⅛	158½
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109¼
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.–Oct 29:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	53	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	16	19
Pittsburg, Pa.–Oct 29:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23½	23⅝
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	62	68
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	‖2,994,839	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co.................com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co..................pref	50	3,000,000	....	J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

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PASSENGER RAILWAYS.

Name.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Oct 29						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Oct 29						
Northampton Street Ry.	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Oct 29.						
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65
Paterson, N. J.—Oct 29:						
Paterson R. R. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Oct 29:						
United Traction & Electric Co.	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Oct 29						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount	50	1,966,100	ǁ1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	300,000	300,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000,000	29,980,450	....	36⅞	37
*e*Electric Traction Co.	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry.	50	500,000	†192,500	$3 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	ǁ1,875,000	$14 sha's A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry.	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry.	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*e*People's Traction Co.	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
*g*Germantown Passenger Ry.	50	1,500,000	ǁ572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	ǁ150,000	8 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	ǁ740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	ǁ277,402	....	...	...
*i*Philadelphia Traction Co	50	30,000,000	ǁ20,000,000	$2 p. sh., Oct. 98.	97¾	98½
*j*Catherine & Bainbridge St.	50	....	ǁ400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar..	50	1,000,000	ǁ580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	ǁ600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	ǁ475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry.	50	750,000	ǁ420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry. guar.	50	....	ǁ200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar...	50	....	ǁ250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	ǁ885,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co.	50	1,500,000	ǁ900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry.	50	750,000	ǁ750,000	$10 share, July '98	262	268
Rochester, N. Y.—Oct 29						
Rochester Railway Co.	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Oct 29						
j Reading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry.	50	850,000	850,000	Jan., '98.	188	...
*l*East Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Oct 29						
Fourth Street & Arsenal Ry.	50	300,000	150,000	....	--	..
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	..	..
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.....com.	50	500,000	500,000	....	20	21
United Electric Ry.....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	..
San Francisco, Cal.—Oct.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63½
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Oct 29						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Oct 29						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.—Oct 29						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Oct 29						
Springfield Street Ry.	100	1,200,000	1,166,700	3 % A.	207	212
Toronto Canada.—Oct 29						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S.	§ 100¾	102¼
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Oct 29						
Belt Ry. Co.	50	500,000	500,000	....	..	..
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co.	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry.	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	20	21
Metropolitan RR. Co.	50	1,000,000	458,960	2½ % Q.	--	..
Worcester, Mass.—Oct 29.						
*Worcester Traction Co.....com.	100	8,000,000	8,000,000	....	81	82½
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Oct 29:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ǁ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

Name.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 29						
American Tel & Tel Co	100	[illegible]	[illegible]	4½ % Q., Jan.	145	146
Erie Telegraph & Telephone Co.	100	......	......	1 % Q., Feb. 20,	99	101
New England Telephone Co.	..	10,204,000	10,204,000	$1.50 p. sh. Feb	124½	125
New York.—Oct 29.						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	100
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	112
*International Ocean Tel Co. guar 6 %	100	3,000,000	......	1½ % Q.	116	112
Mexican Telephone Co	100	2,000,000	......		2	2½
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	165
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co..	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99.	81	81½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Oct 29:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	158	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	128	125
Providence (R. I.) Teleph. Co.	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	...	---	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Name.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Oct 29						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	46
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	.
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	142⅝	143
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	26
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,053	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44½	45
New York.—Oct 29						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co......com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	142⅝	143
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	..
ǁ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	119	125
Pittsburg, Pa—Oct 29						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Oct 29						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	60	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	65	75
Northern Elec. Light & Power Co..	10	550,000	550,000	......	12	13½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Oct 29						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91½	92
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	2 % Q	‡ 193	202
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1½ % Q	133½	135
Thomson-Houston Welding Co.	100	......	......	5 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

ǁ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Name.	Par	Capital Stock. Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Oct 29:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Oct 29:						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co......com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co......pfd	100	2,000,000	2,000,000	7 % A	100	110
Philadelphia Pa.—Oct 29						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	8½	8½
United Gas Improvement Co..scrip.	50	10,000,000	......	---	--	100
Welsbach Commercial Co.....com.	100	3,500,000	......	---	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Oct 29						
Carborundum Mfg. Co	100	200,000	200,000	....	--	--
Standard Underground Cable Co..	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Oct 29.						
*Barney & Smith Car Co.....com.	100	......	1,000,000	---	12	16
*Barney & Smith Car Co......pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	32	--
Consol. Car Heating Co.	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co	100	....	....	---	105	110
*Pratt & Whitney Co......com.	100	......	....	---	2	4
*Pratt & Whitney Co......pfd	100	....	......	---	46	50
Stillwell-Bierce Co......com.	--	....	....	---	--	30
Stillwell-Bierce Co......pfd.	--	....	....	2 % Sept 1, '98.	59	65
Shultz Belting Co.	100	300,000	....	....	80	90
St. Charles Car Co		....	....	......	80	100

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Oct 29, 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1987	J. & J.	117⅛	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*126	127⅛
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Oct 29, 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1982	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	... .	....
†Charleston City Ry...........1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
†Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1906	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1982	J. & J.	108⅛	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	106	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
‡W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‡Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1982	J. & J.	182¾	187

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Oct 29, 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113⅛	114⅛
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Oct 29, 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,835,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry....1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Oct 29, 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5s	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	*$150,000	1912	M. & N.	......	....
Crescent City RR..............1st mtg. 6s.	....	50,000	1899	M. & N.	105⅛	......
Crescent City RR........Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave..........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	10[illegible]⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	109⅛	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98⅛	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry................Deb. 5s.	800,000	800,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	....	110⅛	11[illegible]⅛
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	12[illegible]¾
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Oct 29 1900

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized.
$600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry...................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	....	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Oct 29 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield............5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	. ..
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1919	M. & S.	......	....

Providence R. I.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Oct 29, 1900.

Name	Amount: Authorized.	Amount: Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101⅛	102¼
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101⅛	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	[illegible]000 000	191[illegible]	J & [illegible]	1[illegible]	

*With interest. *Unlisted.

*With interest

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PASSENGER RAILWAY.

St. Louis.

Date of Quotation—Oct 29, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co........................1st mtg. 5s	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99⅛	100⅛
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100⅛
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation—Aug 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126⅛	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126⅛	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105⅛	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation—Oct 29, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co..........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..............................1s mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

Miscellaneous.

Date of Quotation—Oct 29, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co.........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	8,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry.......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	......
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry.........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119⅛
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105⅛	106
St. Paul City Ry..........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	103	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

Boston, Mass.

Date of Quotation—Oct 29 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,.........1st m. 5s, g.	300,000	300,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation—Oct 29, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co................6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......

Miscellaneous.—(Oct 29, 1900.)

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¼	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation—Oct 29, 1900.

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
					100½	101
American Bell Telephone.....................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co.................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—Oct 29, 1900

Name.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating..............7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co...............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co..............................	75,000	....	......	....	115	127

Unlisted †Nominal

NOTES FOR INVESTORS.

Lake quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

Directors of the Westinghouse Electric Company have declared the regular quarterly dividend of 1½ per cent. on the assenting stock.

A dividend of 3 per cent. on Consolidated Traction of Pittsburg preferred stock has been declared, payable November 15, to holders of record November 6.

The directors of the Lowell Electric Light Corporation have declared a dividend of 2½ per cent., payable November 1 to stock of record October 24. Transfer books closed October 24 and reopen November 1.

Directors of the New England Telephone and Telegraph Company have declared a regular quarterly dividend of $1.50 payable November 15 to stock of record October 31. Transfer books close November 1 to November 14 inclusive.

The demand for the stock of the Electric Company of America in the Philadelphia stock market is brisk. It is believed that the regular rate of dividend is to be declared at the coming meeting. Earnings are said to be on the increase.

A special from Philadelphia says: "The Southern Traction Company of Pittsburg has been purchased by the Magee-Widener-Elkins interests of the Consolidated Traction Company. This is regarded as a step in the Union Traction consolidation plan."

The New York State Railroad Commissioners have permitted the Niagara Falls Street Railway to cross the New York Central tracks at grade, and have approved the issue of $750,000 first mortgage bonds by the Peekskill Lighting and Railroad Company.

We understand that Philadelphia Electric Company's earnings for the year ending next month, should show a surplus of something over $100,000 beyond the interest on the P. E. G. 5s. This is over 4 per cent. on the present amount paid in on the stock, $2.50, and on the basis of interest charges as they will stand next year these earnings would represent 8 per cent. on the stock, says the Philadelphia "Stockholder."

The Staten Island Electric Railroad reports for the quarter ending June 30: Gross earnings $78,255, increase, $5,342; operating expenses; $46,155, increase, $3,331; net earnings $32,100, increase, $2,011; other income, $177; increase, $2; total income, $32,277; increase, $2,013; fixed charges, $27,348; increase, $1,248; net income, $4,929; increase, $1,765.

The balance sheet of the Brooklyn City Railroad Company as of September 30, 1900, shows: Assets—Cost of road, etc., $18,925,000; other permanent investments, $350,894; open accounts, $2,787; cash on hand, $2,053; total, $19,325,743. Liabilities—Capital, $12,000,000; funded debt, $6,925,000; open accounts, $36,134; profit and loss surplus, $359,609; total, $19,325,743.

The Worcester (Mass.) Electric Light Company has filed the following certificate of its condition September 12 with the Secretary of the Commonwealth: Assets—Land and water power, $23,655; buildings, $56,920; machinery, $193,251; cash and debts receivable, $99,442; manufactures, merchandise, material and stock in process, $8,525; miscellaneous, $183,846; total, $565,639. Liabilities—Capital stock, $300,000; debts, $31,964; balance, profit and loss, $133,675; total, $565,639.

Advices from Pittsburg, Pa., state that bonds amounting to $3,000,000 belonging to the Southern Traction Company, the Widener-Elkins syndicate, were sold at the Farmers' National Bank in 75 minutes on October 25. Bids for $1,000,000 more were turned away. Pittsburg bought the whole issue, which are 50-year 5 per cent. gold bonds. They sold for $1,000 each. The capitalization of the company is: First mortgage, bonds, $4,000,000; preferred stock, $2,500,000; common stock, $2,500,000. Total, $9,000,000.

The American District Telegraph Company has declared a dividend of 1¼ per cent., payable November 15. Officials of the American District Telegraph Company say that the declaration of a semi-annual dividend of 1¼ per cent. is not an increase in the dividend, but is in accordance with the policy of the company to pay no more than it earns. The company earns more money in the last six months of the year than in the first six months, and last year and this year it declared 1 per cent. on the stock for the first six months and 1¼ per cent. for the last six months, making the annual dividend 2¼ per cent.

There are many rumors current regarding the Brooklyn Rapid Transit Company. Some are to the effect that President Rossiter is about to retire and that the control of the Company will pass to the Metropolitan Street Railway Company of New York or the Pennsylvania Railroad Company. That something is on foot there would seem little doubt, but just what will develop it is impossible to state authoritatively. Regarding the stock of this property the Boston "News Bureau" says: There has been some buying recently on expected good results from the quarterly statement to be filed next month. This will be for the quarter ended September 30, and it is known that the showing will be very favorable. It would not be surprising if Brooklyn Rapid Transit in the September quarter earned about as much on the stock as was earned in the whole of last year.

The annual meeting of the Massachusetts Electric companies is called for November 7 at 12 M., at the office of the trustees, 14 Kilby street, Boston, to elect five trustees, to change declaration of trust making annual meeting third Wednesday in November, instead of first Monday in November, and to authorize trustees to sell or otherwise dispose of certain shares of stock held by trustees. The notice to stockholders states that it will be "impossible to get the full figures of operations of the system in time to prepare the annual report to mail with this notice." The report will be ready about November 10 and will be mailed to each stockholder. No quorum therefore will be expected at the meeting on November 7 and no business will be proposed by trustees except to take an adjournment to 12 o'clock noon November 21, at Lorimer Hall, Tremont Temple, at which time the business above referred to will be taken up.

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ELECTRICITY.

VOL. XIX. NEW YORK, NOVEMBER 7, 1900. NO. 18.

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EDITORIAL NOTES.

"Electricity's" Educational Series.

We wish to call the attention of our readers to the fact that, beginning with the issue of November 14, we propose publishing in the columns of ELECTRICITY a series of articles of an educational nature on Electricity and its Practical Application. The aim of this series is to supply an immense demand arising from a great number of electricians and electrical workers for articles of practical benefit, written in an interesting and instructive manner, for we know that a vast majority of the young men who earn their living in electrical work have not had the good fortune to have a college course in electrical engineering and have learned what they know of the electrical science only by practical experience.

Our attention has been directed to the fact that a large number of the electrical articles published in the journals devoted to that science have been, with few exceptions, unsuited to the general class of the electrical workers owing to the too technical manner in which they were treated. This being the case the author proposes to treat this work in as clear and as popular a manner as the subject allows, making plain, problems that are puzzling to the average electrician, advancing his knowledge and increasing his efficiency in his business capacity. The essays will include such subjects as Electricity and Magnetism, Electrical Measurements, Laws of Induction, Dynamos, Motors, Alternating Currents, Primary Batteries, Storage Batteries, Simple Methods for Electrical Calculation, How to Test for Trouble, Hints for the Dynamo Tender, A Talk to Wiremen, The Telephone, The Telegraph, How to Install an Electric Light Plant, etc. This is only a partial list of the subjects. All will be written with a view of interesting and instructing, and will be illustrated by drawings and sketches so that they will be the more easily understood.

It is our intention to maintain the popularity of ELECTRICITY and to increase its usefulness so that it will be read by every electrical worker in the country. We also wish to add that no electrician can afford to be without it as its columns in this way will be devoted to the education and interest of practical men.

This work will be exclusive in this journal and will be written for us by R. Max Eaton of Philadelphia, a popular young electrician, and, in his own words, the articles will be "Just what you want to know and in just the way you want to know it."

* * *

Municipal Ownership of Street Railways.

The results obtained by the municipal ownership of street railways in England would seem to have tempted the city of Chicago to try, if possible, a similar experiment.

In the Windy City a Municipal Street Railway Commission has been appointed which proposes to introduce at the next session of the Illinois Legislature a measure conferring on the authorities of the city of Chicago the specific right to own and operate street railways. Under its provisions the city will be empowered to negotiate for the purchase of the present street railway plants within the city limits, or, as an alternative, to build an entirely new system.

In this country Detroit is about the only city that has gone in for municipal ownership of its street railways, although, if we are not mistaken, the Mayor of Toledo ran for office on a platform embodying the principle of municipal ownership of public functions.

The advocates of municipal ownership, when debating on the subject, invariably point with pride to the results obtained in Great Britain, and especially in Glasgow, where the fare averages about one cent. per half mile. Although this plan has proven satisfactory to the residents of the Scotch city, the same rate enforced by the street railway companies in New York or Chicago would bring about such a hue and cry as has not been heard for years. A person now rides in this city from the battery to his home in Harlem for five cents, whereas, were the Glasgow rates in force, it would probably cost him ten or twelve. Circumstances alter cases, and this saying applies as readily to the operation of street railways as

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to anything else. Because municipal ownership of street railways has proved fairly satisfactory in such English cities as Liverpool, Sheffield, Leeds, etc., it by no means follows that municipal ownership would prove a thing to be desired in a city such as New York or Chicago. Moreover, in Great Britain the roads, though owned by the municipality, are generally leased to private companies to be operated under prescribed conditions, whereas we venture to say should municipal ownership of street railways become a common thing in this country, in the majority of cases the system, with its army of employees, would be indirectly controlled by whatever politician happened to be the leading spirit of the party in power. Under such circumstances an efficient street-car service is scarcely to be expected, and, owing to this unfortunate condition of affairs met with on all sides in this country, it is to be hoped the Illinois Legislature will make haste slowly in passing the bill the Chicago Municipal Street Railway Commission proposes to introduce.

* * *

The Telegraph System of Porto Rico.

At the next regular session of Congress, in all probability, the matter of the Porto Rico telegraph and telephone service will be taken up. At the close of the war with Spain the telegraph system in Porto Rico was in a most dilapidated condition, and it was only through the untiring efforts of the Army Signal Corps that communication was established between the most important points on the island. The operation and care of the existing lines are still in the charge of the Signal Corps, and it was with a view to making certain recommendations as to to their ultimate disposal that Brigadier-General A. W. Greely, Chief Signal Officer of the Army, recently issued a report addressed to Senator Foraker as chairman of the Committee on Pacific Islands and Porto Rico.

General Greely, in his report, gives a brief outline of the history of the installation and growth, or rather dry rot, of the telegraphic system under Spanish administration. It was not until 1872 that the construction of a telegraphic system was begun in Porto Rico and it was not until 1874 that San Juan was connected by telegraph with the seven departments of the island. This was just fourteen years after the first movement toward getting telegraph lines was begun. The first record of such a movement is in 1860, when the Spanish Government refused a proposition of Senor Don Manuel Cuevas to establish lines on the island. In the refusal Spain took the ground that the Spanish policy forbade the construction of telegraph lines, save under conditions which made Spain the owner of such lines, which, whenever constructed, should be administered and directed by the Government, whose property they were to remain. Spain then suggested that Government lines be built, and, after thinking of this subject for four years, the Superior Civil Government of Porto Rico asked Spain to authorize telegraph lines between San Juan and the chief towns of the seven departments. This authorization was given, but definite estimates were required. This requirement was in the year 1865 and the documents were duly forwarded to Spain. Then Spain sat on the proposition for a year and thought about it. Finally, on June 12, 1866, a royal order approved the estimate—with certain modifications. At last in November, 1866, six years after the project was first put in motion, the royal authority to build the lines was obtained. After fourteen years, in 1874, the little string of some 800 miles was at last completed and Porto Rico had a telegraphic service.

The service that was installed then was precisely the same service that the army found in operation there when the island was evacuated by the Spanish troops.

When the Spanish operators went out, because they were put out and because those who were left would not learn the American system, Signal Corps men were put in their places and are now operating the lines. This makes the work comparatively cheap in a way, for the Signal Corps men would have to be paid, no matter what they were put at; and yet because of the heavy losses during the cyclone and because of the small amount of commercial business on the island the lines have not paid expenses. In his report General Greely says:

"From a practical standpoint, however, if the military advantages of the lines are considered as offset by the pay, subsistence, etc., of the men of the Signal Corps, the normal receipts of these lines under military control will amount to about $12,000 annually, which probably will increase within a year or so to, say, $18,000 annually, an amount entirely adequate for the maintenance and operation of these lines by a paid civilian force."

General Greely refers to the ultimate disposition of the telegraph lines as follows:

"The future disposition of the telegraph lines of Porto Rico is one not free from difficulties. There are three courses open. First, the operation of these lines by the United States Post Office, as was done by Spain in the past; second, the transfer of these lines to the insular Government, with a view to their operation and maintenance at the expense of Porto Rico; third, their operation and maintenance, as at present, as military telegraph lines.

"The first plan would mean a large outlay annually of public money of the United States; and as it would involve a new department with an extensive personnel it has nothing in its favor except the idea that telegraphing is a Governmental function.

"The second plan involves a similar reorganization of the service with a civil staff and their transfer to the insular Government, which is coupled with a certainty that these lines would be a serious financial burden to the people of Porto Rico. There is only one class of Porto Ricans who could be benefited by gift of these lines to the insular Government, namely, the numerous telegraph personnel, which consisted at the time of the American occupation of not less than one hundred and eighty-four employes. It is evident, however, that the old personnel could not be re-employed except by abandoning absolutely American methods for Spanish methods, the latter including a foreign telegraph code and reading by register instead of by sound. Efforts to reinstate as civilian employes Porto Rico telegraph operators have very largely failed, owing to either the inability or unwillingness of such operators to learn American methods. The insular Government would be forced either to hire at high salaries American civilian operators or to return to former Spanish methods.

"The third plan seems to the Chief Signal Officer of the Army the easiest and most natural solution of the question. Porto Rico must necessarily be fortified and garrisoned by troops of the Regular Army, and as it is a detached island, liable in time of war to certain invasion, it is of the utmost military importance that the different garrisons should be in either telephonic or telegraphic communication, thus insuring the greatest possible military efficiency of the defending forces.

"If this suggestion is adopted it may be added that for the execution of this plan no legislation is necessary, as the Signal Corps of the Army is now charged with the operation and maintenance of these lines until action is had thereon by the Congress of the United States. The same policy would be followed with those military lines as elsewhere, namely, the gradual condemnation and sale of lines no longer necessary in the public interest and the maintenance of only those necessary for strictly military purposes."

From the foregoing it will be seen that no suggestion has been made that a private company take hold and operate the lines. As the telegraph system in Porto Rico will ultimately pay this might then be a good opportunity for some one of our large telegraph companies to step forward and make a proposition to the Government looking to the perfecting and operating of the system on that island.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The electrical tower at the Pan-American Exposition at Buffalo, N. Y., which is to be illuminated by electricity generated in Niagara Falls, has now reached a height of 210 feet and from its top one can obtain a view of Niagara Falls and all the surrounding country. As the framework progresses lighter beams are being used, and, as a consequence, the work will be much more rapid from now on. As the wood is built around the iron ornamental staff will be applied to it and some realization of the beauty of the Howard electrical tower, when finished, may be obtained.

G. F. Greenwood, chief engineer and general manager of the Havana Railroad Company, says that the company will begin running trolley cars in and around Havana on Feb. 1. It will have 100 cars, each with seating capacity for 32 passengers. There will be three power-houses, the engines of which are being completed in Milwaukee, Wis.

Mr. George Francis Sever, Pan-American superintendent of electrical exhibits, is authority for the interesting statement that the American Institute of Electrical Engineers has decided to hold its 1901 Convention in Buffalo, N. Y., in June. This Association includes in its membership all of the representative electrical engineers of the United States and Canada. The selection of Buffalo as its meeting place in the Exposition year will mean the assembling in that city of the brightest minds in that important branch of modern scientific research of which the two countries boast. Many of the great European experts will be there as well, for the Institute has sent out invitations requesting them to participate in the deliberations of its gathering next summer. Mr. Sever has been placed on the committee of entertainment, and on the committee which will have the arrangements of meetings and the papers to be read, etc.

A man from Ravenna, O., has invented a contrivance which he expects will revolution-

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ize the working of the street-car trolley. The device is known as a trolley retainer and is attached to the ordinary trolley now in use. It is arranged so that it is impossible for the trolley to get loose.

THE Automobile Show in Madison Square Garden, which is being held under the auspices of the Automobile Club of America, was opened to the public on the evening of November 3. In all there are more than seventy exhibitors, showing about 300 styles of motor vehicles, with a total value of nearly $500,000. There are bicycles, tricycles, quadricycles, runabouts, stanhopes, victorias, landaus, surreys, cabriolets, coaches, cabs, omnibuses, delivery wagons, trucks, racing machines and some nondescripts. The biggest machine is a steam omnibus capable of carrying eighteen passengers. It has platforms at the front and rear, the same as those of a trolley car, and is a part of a large order from a corporation near by which will soon start a line of them. The bus weighs about three tons, and its boiler can develop twenty horse power. The smallest machine is a motor bicycle of 125 pounds having a gasolene motor of two and a quarter horsepower. These two vehicles represent respectively the most expensive and the cheapest machines in the show, as well as the heaviest and lightest; the bus is worth $4,000, the bicycle $280.

A PORT CHESTER band of forty pieces attracted attention at the recent political meetings in Westchester County, New York. Each musician carried a small electric light on his instrument. The current was furnished by a storage battery which the player carried in his pocket. The lights, which were of various colors, added brilliancy to the parades.

ELECTRICITY is to cut an important figure in the operation of the coal mines in the southern part of Fayette County in Pennsylvania. It will be used as a motive power inside on the chief haulage ways.

PROF. CARL MYERS of Ilion, N. Y., owner of the Frankfort Balloon Farm and Experiment Station, has been for the past four weeks at St. Louis under contract exhibiting his sky cycles, airships and ærial electrical torpedo. The latter is the most recent product of the Frankfort Balloon Farm, and its four weeks at the St. Louis Coliseum is its first appearance before the public. The professor stated that his electrical ærial torpedo is a hydrogen gas spindle of peculiar shape, adapted to avoid ærial resistance, balanced in mid-air and operated by the force of electricity driving the most powerful dynamo of its size ever constructed. There are two silken air planes on each side which catch the air. He said: "The purpose of the vessel is to demonstrate the ease with which real air navigation is accomplished and the ready means of accomplishing 'peace on earth' by dropping from the sky explosives so destructive as to annihilate the art of war." He will, it is said, give an exhibition at the Automobile Show in Madison Square Garden in this city.

IT is well for this country that a splendid exhibition of the products of the United States was made at the Paris Exposition, now soon to close. The Exposition will be a great benefit to the manufacturers on this side of the Atlantic. This is proved by the consular reports now being made to the State Department. They show an increased demand for electrical supplies and machinery from Europe. Orders are reported from countries and remote parts of the globe where imports with the American stamp have been unknown heretofore.

THE list of exhibitors at the Automobile Show to be held at Grand Central Palace November 14 to 24 (Horse Show period), suggests, at first glance, that it is a continuance of the Madison Square Garden Show, for a great number of the vehicle concerns already published as being in the Garden Show will exhibit at Grand Central Palace. Undoubtedly good business reason and common sense are back of the Palace exhibition as it occurs, not during the warmest political week of the whole campaign, but after the turmoils of election are over and when things have resumed their normal routine.

NEW YORK ELECTRICAL SOCIETY.

The New York Electrical Society held its first regular meeting of the season at the College of the City of New York on Tuesday, October 30, when in spite of the inclemency of the weather, a good attendance assembled to listen to various addresses on the electrical features of the Paris Exposition, and the work of the Electrical Congress. Mr. Carl Hering, President of the American Institute of Electrical Engineers, was the first speaker, and delivered an admirable address on the lighting features and novelties of the great show, making many cogent criticisms in passing on the features of merit or difference, in connection with the leading European and American exhibits. His remarks were followed by the exhibition of some very interesting and handsome lantern slides covering not only the technical features, but some of the more artistic and spectacular portions of the exhibition. He was followed by Dr. A. E. Kennelly, who addressed his remarks more particularly to the modern steam turbine, as illustrated by the "Turbinia," which was exhibited on the Seine, within the Exposition enclosure. He also took up and described in detail the mechanism of the moving sidewalk, his remarks being also accompanied by lantern slides. He took a very hopeful view of the future of the steam turbine, both ashore and afloat. The third speaker was Mr. C. O. Mailloux, who gave an entertaining description of the whole work of the Electrical Congress, and of the manner in which the American delegates succeeded in carrying through their programme with regard to the new units which were adopted, or rather approved officially. Mr. Mailloux's references to the manner in which the members of the Society had taken an active part in this work elicited very hearty applause. At the close of the meeting, as some little recognition of the courtesy of Messrs. Hering and Kennelly in coming before the Society and entertaining its members so instructively, they were elected honorary members by a hearty and unanimous vote of thanks. Following up the admirable work done during the two years of his administration by President Dunn, the Society has started out on its present season with renewed hope and vigor, and the secretary was able to present a list of twenty-seven candidates for membership, who were duly elected. It was also announced that during the present month Mr. Steinmetz will deliver a lecture before the Society on Alternating Current Work, and that in December, Dr. Sheldon will deliver an address on Electrical Measurements of Precision.

THE POLLAK-VIRAG WRITING TELEGRAPH.*

In the Pollak-Virag system of high-speed telegraphy [described in ELECTRICITY October 25, 1899] the receiver, it will be recalled, consisted of a telephone whose diaphragm was moved by impulses received from the line. To the diaphragm a rod was attached which moved one of three points on which a small concave mirror reposed; and the beam of light reflected from the mirror registered the movements of the telephone diaphragm on sensitized paper, which was moved forward uniformly on a drum. The small mirror was held in position on two pointed prongs of one pole of a stationary permanent magnet and one movable prong constituting the other pole of the magnet by having cemented on its back a small piece of

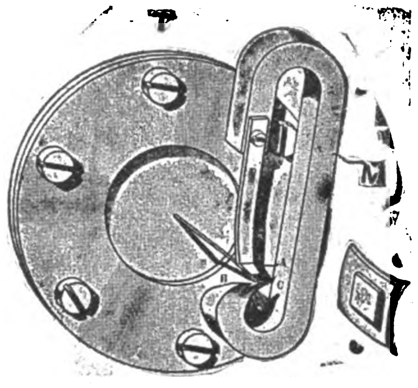

FIG. 1.

soft iron. It is to this movable prong that the rod from the telephone diaphragm was attached.

During the past year the inventors have greatly improved their apparatus. Fig. 1 shows the most recent type of diaphragm and mirror connection, while Fig. 2 gives a good idea of the arrangement of the parts of the complete receiving apparatus. By this apparatus messages are received and recorded in a zig-zag line as before; but now the record is traced in lines running from left to right of a broad strip of sensitized paper. This left-to-right movement is produced as follows: The source of light is a stationary glowing filament which is surrounded by the cylindrical metal mantle L (Fig. 2). In this mantle a helical slit is cut, the helix having one complete turn.

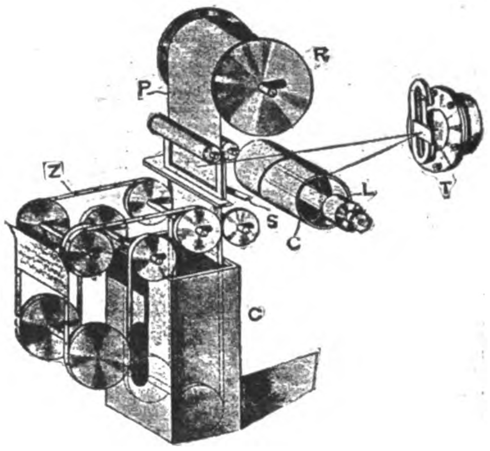

FIG. 2.

In consequence, when the mantle is appropriately turned about its axis, the source of the light falling on the mirror moves in effect uniformly from right to left, and hence the spot of light formed on the paper by reflection from the mirror moves uniformly from left to

* From the "Electrician," London.

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right. A series of motions of the mirror about a horizontal axis is recorded, therefore, on the paper as an up-and-down zig-zag line running from left to right, and commencing at the left end of a new line on the completion of every filled one. On the commencement of a dispatch the revolution of the helically-slit mantle and of the sensitized paper feeder R is automatically started. At the close of the dispatch the paper strip is cut, and the movement of the unexposed paper stopped, while the exposed strip is carried forward by clockwork into the

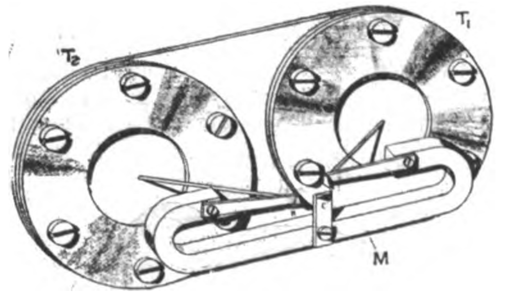

FIG. 3.

developing bath C, then into a neighboring fixing bath, and is finally pushed through a slot in the outer cover of the apparatus.

The apparatus in Fig. 1, however, yields only the zig-zag writing. For the recording of a message in the characters of ordinary handwriting, a double apparatus (Fig. 3) is necessary. This differs from the apparatus just described in having two telephones, and in having the concave mirror supported upon one fixed point and two movable points. One telephone moves the mirror about a horizontal axis the other about a vertical axis, so that acting simultaneously the telephones can cause the reflected spot of light to trace any desired curve. A double-line wire is used. One telephone is, as before, in the loop of this wire; the other is between the loop and the earth. For producing the horizontal motion a positive current and a negative current of approximately equal

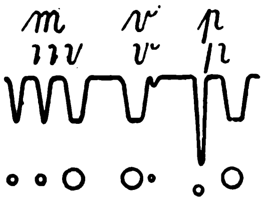

FIG. 4.

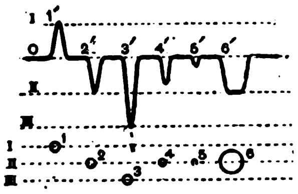

FIG. 5.

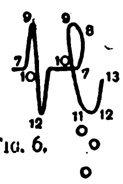

FIG. 6.

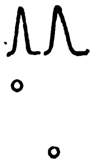

FIG. 7.

voltages are required; for the vertical movements a positive current and an equal negative current and a positive current of double their voltage serve. Corresponding to these are obtained motions to left and to right, and up-and-down motions of equal amplitude, and a downward motion of double this amplitude. Fractions of this amplitude are obtained by shortening the duration of the contact at the sending end. This contact apparatus consists of a perforated paper strip, five slip rings connected to the batteries, and two brushes connected to the line. The size of the holes in the paper determines the duration of the contacts between the brushes and rings.

If the ordinary written Latin characters be dissected it will be found that certain of them, such as *m*, *v*, *p*, can be resolved into elements each consisting of a down and up stroke commencing and ending at the same height above the line. The letter *m* consists, for example, of three such elements, the letters *v* and *p* each of two. In order to cause the receiver to write letters which can be analyzed in this way the currents sent from the sending end to produce vertical movements in the receiver are regulated with respect to direction, intensity and duration. This is done by perforating the paper strip with larger or smaller holes in three rows I, II, III (as in Fig. 5) corresponding to the three rings operated by one brush. A hole in row I, exposes to the brush the ring supplying a negative current of known voltage, in II the ring supplying a positive current of

PERFORATIONS.

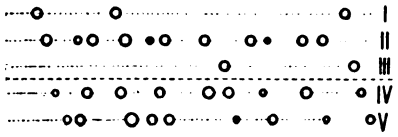

FIG. 8A.

VERTICAL.

FIG. 8B.

HORIZONTAL.

FIG. 8C.

RESULTANT

FIG. 8D.

equal voltage, in III the ring supplying a positive current at double that tension. And the effect on the mirror of the receiver of holes punched as in Fig. 5 is shown above the plan of the perforations in the same diagram. It is a matter of trial to fix on that size of hole which allows just sufficient time for the current to exercise its full effect on the telephone. A larger hole then merely broadens the loop the spot of light traces on the moving sensitized paper in the receiver; while a smaller hole displaces the spot of light to a distance which is a fraction of the full amplitude. The perforations necessary to produce the elements of the letters *m*, *v*, *p* are shown in Fig. 4, where the elements are, moreover, so combined and spaced as to write the letters distinctly and in order.

But the written Latin characters include many composed partly or wholly of closed curves, and these cannot be written by the mere up-and-down movements so far described: properly timed to-and-fro horizontal motions are necessary in addition. Such letters are therefore resolved into and compounded from vertical and horizontal components. The movements of the receiver mirror corresponding to each of these components are each produced by separate current impulses, and the time intervals between these impulses are chosen and obtained by deciding on the spaces to separate consecutive holes in the perforated tape. Take for example the letter *l*, which contains a closed curve or loop. Its vertical components merely, are written by the mirror as in the left-hand portion of the diagram in Fig. 6. This up-and-down zig-zag is the result of stimuli sent into the line through the perforations I, II, acting alone. The first hole, in row I, causes the curve 7, 9, 10, to be described on the moving paper; the second hole, in row II, produces the curve 10, 12, 13. But when a hole is, as shown in the figure, punched in the row IV, so that a current deflecting the spot of light from right to left is sent into the line, as soon as the spot of light in its upward motion due to hole I, reaches the place marked 8, a deviation to the left is produced—in spite of the forward march of the paper—which carries the spot of light to 9. Here the current through hole I ceases, and the spot of light returns to 10, where it is immediately, in consequence of the coming of hole II, given a downward motion towards 11. Here the effect of hole IV dies out, and the mirror, in restoring itself to its normal position, then writes on the moving paper the broad loop 11, 12, 13. Thus the second of the two telephones, by its production of horizontal to-and-fro motions of the mirror's normal, makes it possible to write letters containing closed curves.

In this manner any character of the alphabet can be written. The character must be analyzed at the sending end into its horizontal and vertical components defined as above and compounded at the receiving end by the two telephones. The telephone T_1, Fig. 2, gives the spot of light the vertical motions dictated by holes in rows I, II, III; the telephone T_2 the horizontal motions demanded by the holes in rows IV, V. The construction of the complete word "telegraf" on these principles is shown in Fig. 8. FIG. 8*a* gives a plan of the perforations in the sending strip; *b* gives the written record due to the telephone T_1 operated from the rows I, II, III; *c* represents the effect on the telephone T_2 of the holes in rows IV, V; and *d* is the resultant of the vertical and horizontal components.

The sources of current are two comparatively small batteries connected to the rings, line and

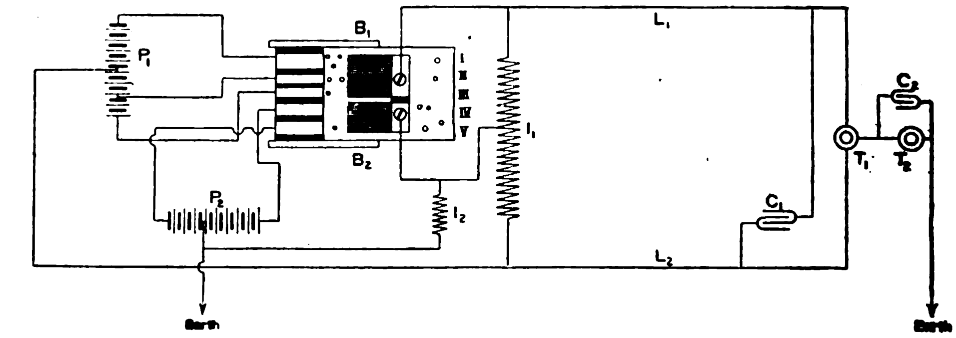

FIG. 9.

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earth, as shown in Fig. 9. From the first battery P_1 are taken equal positive and negative currents corresponding to rows I and II of the perforated paper, and also a positive current of double the value corresponding to row III. From the second battery P_2 are taken a strong positive for the leftward deflection of the spot of light and a weak negative for the rightward deflection. It will be noticed from this diagram that, as before mentioned, only the telephone T_1 is included in the loop of the double line, the telephone T_2 receiving its impulses after they have passed as two oppositely-directed currents of equal strength through the telephone T_1.

The self-induction and the capacity of the wires and the effects of the natural oscillation-periods of the telephone diaphragms are compensated in a manner virtually identical with the method employed by Messrs. Pollak and Virag a year ago. These compensating coils and condensers are diagrammatically positioned in Fig. 9, where I_1 and I_2 are inductance coils and C_1 and C_2 are condensers. By modifying the condenser C_2, moreover, the phase difference between the horizontal and vertical motions can be adjusted to a certain extent. As a final detail we ought to add that the perforating of the paper sending-strip is accomplished by a simple machine which punches simultaneously all the holes corresponding to any required character.

There is in this system of telegraphy no need for the syntonizing of the sending and receiving apparatus, for variations in the speed at either end merely broaden or narrow the letters; and, therefore, the inventors claim that this system is simpler and more reliable considered merely from this point of view. Besides, with the aid of a distributer (such as Bandot's), about 30 sets of apparatus can work on one line.

At some recent trials, allowed by the Hungarian Minister of Commerce, a distance of 400 km. (nearly 230 miles) from Budapest to Pozsony and back was spanned by two pairs of telephone wires, and most excellent results were obtained. The rate of transmission—at which rate very good writing was produced—reached 1,000 words per minute through a resistance of 2,000 ohms.

AUSTRIAN ELECTRICAL EXHIBITS AT PARIS.

BY FRANK C. PERKINS.

A number of the Exposition buildings in the Esplanade des Invalides are lighted by current from the three-phase alternators of Ganz & Company of Budapest. A 1,200 kilowatt polyphase generator is operated by a cross-compound engine built by Erste Brunner Engine Company. This alternator has thirty poles mounted upon a revolving field which acts as a fly wheel for the engine. The speed of the engine is 125 revolutions per minute. The steam cylinders are about 20″ x 37″ in diameter, and the stroke is about 36″. This polyphase alternator generates a current having a frequency of 32 cycles per second and operates at a potential of 2,200 volts.

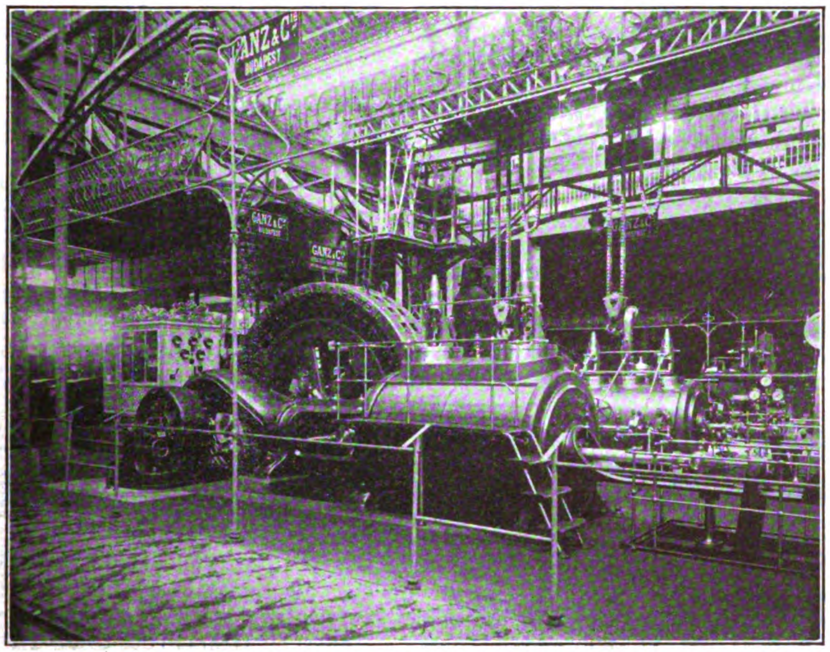

Fig. 1.—A Ganz & Co. 1,200 KW. Generator.

The current is conducted from this machine to the lighting circuit, after being transformed at five transformer stations located on the bank of the river below the Alma Bridge. The exciter for this machine is a multipolar direct current generator directly connected to the main shaft.

The historical exhibits of this company include transformers, motors and dynamos dating back to 1879. The "Transformateur a Manteau" was built in 1885. A polyphase generator is exhibited which was made in 1879 while a machine of the type "Gnom" was built in 1882. Among the other historical exhibits shown is a "Transformateur Noyau" dated 1880, and a machine of fair size marked "Moteur a Courant Alternatif Simple Continu, 1891."

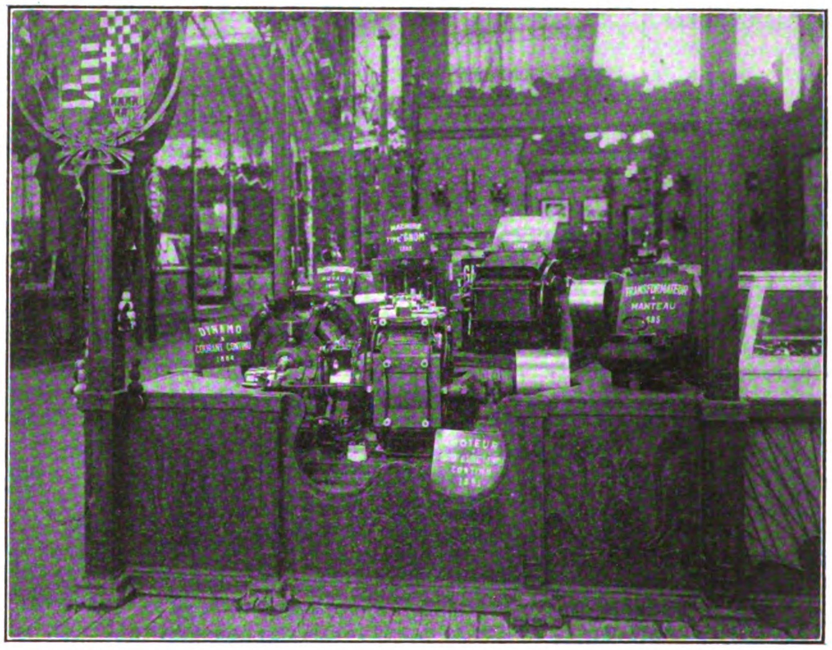

Fig. 2.—Historical Exhibit of Ganz & Co.

The alternator built by Ganz & Tarsa of Budapest, which is directly connected to the Lang cross-compound engine in the Austrian section, also furnishes a three-phase current at 2,200 volts potential, and has a frequency of 50 periods per second. This machine is located in the main exhibit of Ganz & Company, and in the same space is shown a new electric traveling crane, a smaller three-phase generator and exciter and a number of polyphase motors of various sizes and designs. A very fine line of arc lamps are shown in operation, together with some very interesting electrically-operated machine tools, including milling machines and stamping machines. The three-phase electric locomotive has received a great deal of study by this firm, and the locomotive exhibited has attracted considerable attention, as this field of work is entirely new, little having been practically and commercially accomplished in this line heretofore.

CONSOLIDATION OF STREET RAILWAYS AND ITS EFFECT UPON THE PUBLIC.*

BY DANIEL B. HOLMES.

It is no part of the purpose of this paper to enter into an extended discussion of street railway consolidations from a legal point of view. It is assumed that no considerable number of those present would be particularly interested in that branch of the subject. Suffice it to say that the laws of nearly, if not quite, all of the States of the Union are in such condition that practical street railway consolida-

* Paper read before the Nineteenth Annual Meeting of the American Street Railway Association held at Kansas City, Mo., October 16-19, 1900.

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tion may be brought about and made effective by union of companies as a technical consolidation, or by purchase and sale of the corporate property or capital stock, or by common ownership of the corporate shares of several companies, or in other ways which might be mentioned. Whenever consolidation is desired by the parties in interest, it may be safely assumed that counsel learned in the law will find little or no difficulty in pointing out the way in which that end may be legally accomplished.

Street railway companies may be properly classified as public service corporations, and whenever a union takes place of several such companies, it at once becomes obvious that the interests of the capital invested and of the traveling public may and probably will be positively affected thereby. Therefore these two interests will form the chief basis of what I have thought proper to lay before this convention of practical street railway men, whose calling is such that they never feel at liberty to disregard either the best interests of their stockholders or the welfare of the dear public, whose constant servants they are. And I may be permitted to say, in the light of an experience and intimate association with street railway managers extending over a period of upwards of twenty years, that no class of men with whom I have come in contact in the active practice of a profession which brings about the most intimate relations with all sorts of men, are so constantly mindful of the best interests of the public they serve by night and by day as the street railway men. I am the more pleased to make this acknowledgement because the street railway man has so many impatient masters among the traveling public that he is much more often the subject of unjust criticism than of the well-deserved encomiums he would surely receive if the difficulties of his situation and his conscientious efforts to faithfully discharge his company's duty to the public were even half-way understood. Above all men it is his lot to bear the "whips and scorns of time," and if he will but pin his faith to the teachings of the Good Book, he may expect to receive hereafter that reward which in but few cases, I am sorry to say, comes in this life in the shape of an adequate salary for so hard and thankless a job.

That the consolidation of street railway interests affords opportunities for the introduction of many various economics is a truth which is almost axiomatic, and this may be fairly said to have been the controlling consideration which has inspired and accomplished the many consolidations which have taken place in various parts of the country. By this process the managerial force is greatly reduced and the salary list largely diminished. Where three or four presidents, managers or superintendents were required for the successful management of the separate properties, but one officer of each kind is needed in their united state, and while he receives more salary than any one of his predecessors, as of right he ought, because of enlarged duties and more weighty responsibilities, still there is substantial saving over what was previously paid.

But there is, in this connection, a still more important consideration. As is the case with any other calling in life, the supply of really first-class street railway managers is more or less limited, and the larger salary offered by the consolidated interests naturally commands, and in all probability secures, a higher order of talent than the separate properties could retain even where it had been fortunately possessed. In this way, the consolidated properties in nearly every instance are managed with greater ability than was shown by the management of the disconnected parts, and this is a positive gain, the value and importance of which can scarcely be estimated. This successful manager, you may be sure, is truly a remarkable man. The relations existing between street car companies on the one hand, and the municipality or its citizens on the other, are the fruitful source of jealousies and complications constantly arising which can be successfully disposed of by nothing short of the possession of genius for diplomacy, and for affairs and finance all at the same time, in order to be able to satisfy the demands of the public without involving the company in irretrievable financial ruin.

In most instances, the consolidation of street railway properties creates opportunities for marked reduction in the cost of generating motive power. Location is a most important consideration as regards the power station. Unless the power station is so situated that both fuel and water can be delivered to it at minimum cost, the highest degree of economy in developing motive power is altogether impossible. This is greatly facilitated by the union of properties since the car lines are so situated in most cities that but few of them, if independent, could operate from power stations located near steam railroad switches and water courses. A greater or less number of high priced employes are always necessary around every power station whether large or small, and this is an expense which is greatly curtailed by generating as much power as is practicable to handle from one station. A company possessed of an extensive system with large mileage has thus presented to it the opportunity of producing power at the minimum cost, a thing altogether impossible on a short line railroad.

But perhaps the most important result from consolidating street railway lines is the great stimulus it affords to street railway traffic. Outside of a few of the very large cities where the problem is not how to get business but how to successfully handle that business which of necessity must come to the car lines, the street railway companies are quite generally engaged in efforts of all kinds to create travel on the lines artificially by offering to the public attractions of various and sundry kinds. This is all well enough, but one of the most effective means to this end is the consolidation of the street car lines. I believe it is the uniform experience that the aggregate travel on the united lines exceeds by a large percentage the business formerly done by the separate properties. This is partially accounted for by the fact that short distances are now ridden which were formerly walked, because two fares were then necessary in order to ride, and this was considered too great an outlay for the accommodation afforded.

But how stands the case with the public? I am altogether sure it is no different. Indeed, the immediate benefit to those who ride upon the cars far exceeds the increased returns to the consolidated company. Where before the union, two and even three fares in some instances had to be paid in order to convey the passenger to his destination, he may now take the same journey for a single fare by means of transfers and through cars which were previously impossible. Taking Kansas City as an example 50 per cent. of all the passengers who ride on the cars make at least one transfer in every journey, so that it may be truly said that 60,000 passengers save five cents each and every day in the year in Kansas City alone, and this saving is due solely and directly to the consolidation which took place only a few years ago. And who are the people thus benefited? It is chiefly the laboring classes who can least afford to spend their hard-earned gains unnecessarily. The sons of toil who were formerly compelled to shelter their wives and rear their children in the polluted air and noise and smoke because unable to pay more than a single fare in going to and from their avocations, can, and do now, dwell in the neat little cottages in the suburbs where loved ones breathe the pure air of heaven and bask in the sunshine of life all day long, and when eventide comes, smiles and mirth and joy are the companions who have taken the place of sickness, suffering and grief. Who can estimate the value of blessings like these? If the public welfare is the first and highest duty of the State, who can gainsay the immense value to the public of street railway consolidations, and who can say that the State ought to throw any obstacles in their way.

But it is said that competition is the life of trade, and that monopolies are odious. Accepting these as general truths, let us see how it is with the street railroads. Except to a very limited and unimportant degree, there is no such thing as competition in street railroads, and their consolidation is entirely devoid of any objectionable feature of monopoly. In the very nature of things, street railroads are seldom competitors in business. They were never known to compete in rates, and can only be laid on such public highways as the authorities may determine. The necessity for keeping some streets open for ordinary vehicle traffic keeps the street railroads sufficiently far apart as a rule as to eliminate any matter of choice on the part of the intending passenger. Each line supplies and accommodates its own peculiar territory, and there is no real choice, and hence no real competition. As to rates, these are universally fixed by the franchise ordinances. They are the same on all the roads, so that the intending passenger is moved in his choice solely by consideration of convenience to himself. In short he simply takes the line that carries him to his destination with the least inconvenience. Monopolies are only odious when of a character that they do or have the power to fix their own price for what they alone can sell. Not so with the consolidated street railway. So far from having the power to increase the cost of travel, consolidation always results in a practical reduction of cost by giving to the passenger the right to ride for the same single fare the increased distance brought about by the consolidation. No thoughtful man would condemn a street railway consolidation because it neither stifles competition nor increases cost of travel, nor creates a monopoly as that term is generally understood.

There can be no doubt that consolidations of this character are greatly beneficial both to invested capital and to the public at large. And, happily this is so, because the public is never so likely to have its wants provided for as when it is to the interest of capital to do so. There is no tie so strong as common and mutual interest. This is a principle which would render many conflicts and controversies impossible, if kept always in mind and strictly adhered to in all dealings between public service corporations and the municipality in which they dwell.

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I commend it to the thoughtful consideration of all who are assembled in this convention as the firm foundation on which aggregations of capital may safely rest, the Gibraltar of justice and right, garrisoned by an always sound and healthy public sentiment, against which the assaults of prejudice, passion and demagogy would be hurled in vain.

A NEW CONSTANT-POTENTIAL CONTINUOUS CURRENT TRANSFORMER.*

BY F. W. DAVIES.

There are probably few electrical engineers, who have had much practical experience in the running of continuous current transformers but have realized the advantages of employing machines that would give a constant potential at all loads, thus avoiding the necessity of compensating for the voltage drop in the secondary at full load by means of a small "booster."

The writer's object is to describe, as briefly and concisely as possible, a simple method of compensating for the voltage drop in the secondary at full load, which he has discovered. This method is analogous in its effects to the "compounding" of a dynamo, and the winding of the same, like the series winding of a compound dynamo, may be so proportioned that the secondary voltage at full load is either less than, equal to, or greater than the voltage on open circuit, corresponding to the "under-compounding," "compounding," and "over-compounding," respectively, of a dynamo. It can

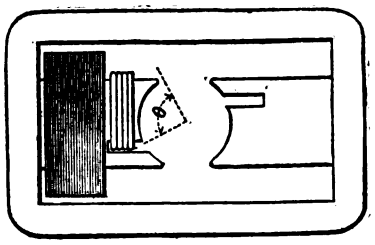

Fig. 1.—Showing Coils Removed from One Pole.

easily be adapted to existing designs, and as the writer has not protected it by letters patent, some engineers may possible consider it worth their while to adopt it. It is applicable only to transformers of the single field type, where both the primary and secondary armature windings are wound upon one core, and not to those machines which consist of a dynamo and motor mounted on one bedplate, with their armatures rigidly coupled together.

It is proposed to vary the ratio of transformation as the load increases by means of a particular arrangement of the armature winding used in conjunction with a special compensating winding on the field magnet; this variation in the ratio of transformation to be such that the E. M. F. in the secondary circuit shall be raised by the amount necessary to compensate for the loss in volts at the increased load.

For the sake of simplicity a two-pole machine is considered, the same principle being easily extended so as to include multipolar machines. The principle of construction is as follows: The field magnet may be of any type, but each pole must be provided with a slot in which the compensating coil is wound as shown (see Fig. 1). These coils must be connected in series with the secondary circuit, and connected up so as to assist the main magnet winding. Their function is to strengthen the flux in the magnet pole on one side of the slot and to weaken it on the other side; in other words, the object is to concentrate the lines of force of the field magnet within the area enclosed by the compensating coils. The armature is shown in Fig. 2.

To render the winding more clear only two coils, one primary and one secondary coil, have been shown. The primary coil is wound with any usual pitch, provided it is sufficiently great for the coil to enclose the whole armature flux when the coil is in the neutral position, that is with its plane at right angles to the field. The secondary coil, as will be seen, is chord wound. Its pitch should be such that it just encloses the lines of force which pass through the compensating coil, but it should not enclose any more than this. In other words, the angular pitch of the coil must be approximately the same as the angle θ (Fig. 1). A diagram of the complete armature, showing six coils in the primary winding and six coils in the secondary winding, is shown in Fig. 3.

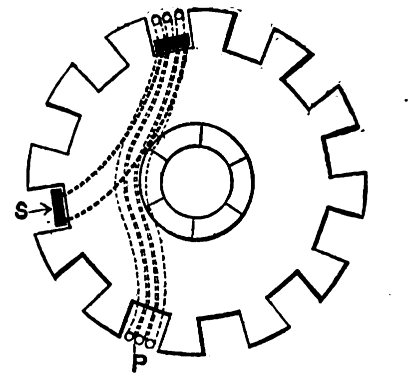

Fig. 2.

The action of the transformer is very simple. At light load when there is no current in the compensating coils, those lines of force which are embraced by the compensating coils, are usefully cut by both the primary and secondary windings, but the remainder (i.e., those passing through the small polar horn on the other side of the slot in the pole piece) are useless as far as the production of E. M. F. in the secondary winding is concerned, owing to the

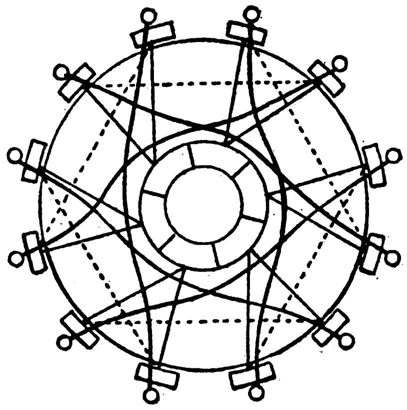

Fig. 3.
Winding Diagram Showing Connections at Secondary Commutator. Secondary Coils represented by rectangular bars; Primary by small round bars.

small pitch of the coils in the secondary winding (both limbs of a coil being under the same pole for a certain period in each revolution of the armature). This makes the ratio of the secondary volts to the primary volts less than it otherwise would be. But as the load increases the compensating coils begin to act. They divert some of the lines from the small polar horn and drive them through the polar area enclosed by the compensating coils, the total flux remaining practically constant. The result is that a larger proportion of the lines is usefully cut by the secondary winding, until at full load practically the whole of the flux is available for producing the E. M. F. in the secondary winding, and the ratio of transformation is then the same as the ratio of the total number of active conductors in the two windings, less the loss of the internal resistance of

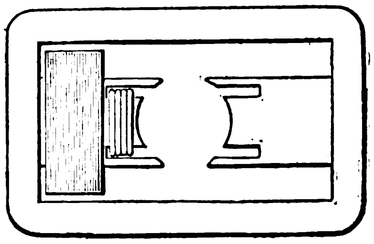

Fig. 4.—Showing Coils Removed from One Pole.

each armature winding. The effect of this is that the transformation ratio $\frac{\text{Secondary E. M. F.}}{\text{Primary E. M. F.}}$ is greater at full load than at light load, and by designing on these lines the pitch of the secondary armature winding and the number of turns on the compensating coils may be so proportioned as to give any desired rise of secondary E. M. F. at full load.

The above arrangement may, of course, be modified in various ways, although the general construction above described is probably the best. For instance, instead of the single slot

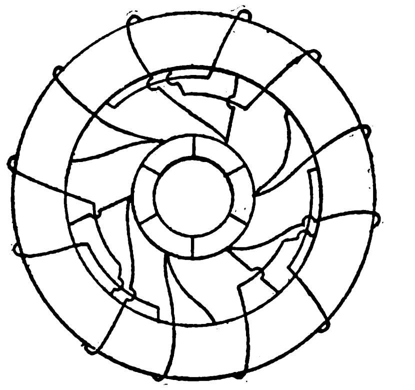

Fig. 5.

in the magnet pole shown in Fig. 1, two slots may be used, and the compensating coils wound in them, as shown in Fig. 4. The chief disadvantage with this construction would be that, owing to the weakening of the polar horns by the compensating coils, it would be difficult to get that essential for good commutation—a strong reversing field. Then, again, a ring armature may be employed in place of the drum armature if desired. In this case a winding of the secondary, similar to that shown in Fig. 5, might be used.

The invention above described can also be applied to machines having four poles and upwards: it being essential, of course, that the coils in the secondary winding are of such a pitch that they only embrace a part of the total magnetic flux at light load, the variation in the ratio of transformation from light load to full load being obtained as in the case of two-pole machines by means of compensating coils on the magnet poles. In any case, the principle of compensating for the drop in the secondary by means of varying the ratio of transformation—this variation being obtained by means of compensating coils wound on the magnet poles in the manner above described—remains the same.

*From the "Electrical Review," London.

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SNOW AND SNOW PLOWS.*

BY RICHARD E. DANFORTH.

Our friend, the supply man, tells us that the proper time to consider the question of snow fighting apparatus is when the leaves are on the trees and the shirt-waist man is in evidence. Following this very proper suggestion, your attention is called to some of the problems connected with the removal of snow and ice, with the hope that a comparison of experience will lead to a general improvement in the appliances used and the methods followed in handling this troublesome substance.

It might be stated as a general proposition that street railways have, in their snow plow equipment, failed to keep pace with their improvements along other lines. A dozen years ago it was thought sufficient to equip passenger cars with 10-hp. motors. The severe strains placed upon these motors during the winter months caused the manufacturers to increase the capacity of motors from time to time, and this and other kindred reasons have led to the final adoption of motors averaging a capacity of 50 hp. each.

Passenger car bodies and trucks have increased in dimensions and weight so that it is not an unusual thing at the present day to see in daily service passenger cars 40 feet long, weighing, with motor equipment and trucks, 23 tons. Street railway managers and manufacturers have failed in many cases to realize that a car built to effectively remove snow from the tracks and ice from the rails must be heavier and equipped with more powerful motors than the passenger cars operating on the same lines. Five years ago a snow plant, equipped with two 35-hp. motors and having a total weight of 6 tons or 8 tons, was considered a fine piece of apparatus for removing snow. These plows, during heavy storms, and with the aid of one or more passenger cars as pushers, have been able to keep a few miles of track clear. Experience has shown, however, that the plow above referred to is not perfection.

Each manager, aware of the defects in his snow fighting apparatus, has endeavored to make improvements, with varying results. A road at one corner of the State copies the steam road rotary snow plow. A road at the other corner of the State builds share and nose plows of great weight, and still another road tries sweepers.

In comparing notes with our neighbors, it will be well to remember that conditions vary in the different cities and parts of the State. What might give most excellent satisfaction in Binghamton might prove most unsatisfactory in Buffalo, and might not be permitted by the common council in Greater New York.

It might be well to first consider the different kinds of snow which usually falls during the three or four winter months, and its effect upon the transportation facilities of the locality. It is generally conceded that a wet snow is a bad snow, and that systems having grooved rails are most liable to be blocked by this snow. A wet December snow falling in considerable quantity, before the frost has fully entered the ground, puts a most severe test upon the capacity of the transportation department to keep the cars of a system in motion.

The first few inches' fall melts as it strikes the rail, and, in melting, cools the same. By the time 6 inches have fallen, a coating of slush is formed over and about the rails, which, upon the passage of a wagon or other vehicle, whose wheels press out the moisture, becomes a coating of ice upon the rail and in the groove. The ordinary snow plow, equipped with gravity flanges or diggers, fails to make any impression upon this coating of ice, and usually lands in the gutter. With the usual equipment of one plow to from 5 miles to 10 miles of city track in streets where there is considerable wagon traffic, and the cars at frequent intervals, the result of the above conditions is a tie-up and a call for the track department with picks (and salt).

The Toronto Railway Company successfully meets this situation by equipping its cars with track scrapers, which are not only supplied with a steel flange of proper form for removing ice from the groove, but are connected so that a powerful leverage can be placed upon them when required. These track scrapers cut the ice from the rail as easily and smoothly as a planer takes a cut from a piece of metal. Properly adjusted, they can be run through switches and around curves with safety.

Experience has shown many of us the necessity of equipping all snow plows with devices having the same action as the above described track scrapers, but we have yet to learn that the best way to meet this condition is to equip our passenger cars so that we may at all times be sure of having a clean track groove.

When the thermometer approaches zero the conditions change. With fine, dry snow, which forms hard drifts but doesn't freeze nor attach itself to the rail, the difficulty then arises of obtaining sufficient traction between the frosted wheels and rail. Lightweight cars and plows make no headway without the use of sand, and at this time we find the advantage of weight in our equipment. The use of salt under these conditions but aggravates the case by the formation of slush, which sticks, and finally freezes, to everything it touches. Sand is but a makeshift, and soon causes trouble by filling up the grooves in the rail, and causing flat wheels; but it is of great service in keeping cars in motion, as well as in stopping them when under headway.

When the temperature is in the neighborhood of 20 degrees, the falling snow is usually feathery and light, and easily handled. Two feet of this snow doesn't cause the trouble that 6 inches of wet snow will make. The problem in removing this snow from the track during a heavy fall is one of having plows running at close intervals or those designed to remove from the track large quantities without delay. This snow drifts quickly and under a light wind. On lines operated through thinly settled districts and subject to large drifts, we find at this time a rotary of great value. A share plow will do the work perhaps more quickly during the first storm; but as the banks at the side become high and are frozen solid (unless carted away), the share plow is of little service, having no place to shove the snow, while the rotary picks it up and scatters it to a great distance.

A description of the various types of snow plows and snow handling appliances might well be given at this time. A relic of horse car traction is found in the walkaway plow, which is nothing more or less than a crude road machine drawn by horses, consisting of four wheels, a modified wagon frame and board. This machine proves valuable in leveling back drifts beyond the reach of electric snow plows.

The step from a walkaway to the leveler is but a short one, the leveler being merely a light flat car, drawn by power outside of itself, and having suspended under its body boards placed diagonally across the track.

Next in order comes the electric leveler, having its shares, or boards, placed diagonally under the body and between the wheels, the motive power being transmitted to the wheels through sprocket chains from motors upon the car floor.

Following steam railroad practice, plows are also constructed with a board placed in front of the plow proper and diagonally across the track, so that the work of removing snow is done in front of the car instead of being done under the car, as by the above described levelers. The first of these plows were blunt affairs, ramming the snow and forcing it horizontally to one side. A modern plow of this type is more carefully designed, the share being so constructed as to first lift the snow, and then roll it over and over until it is clear of the track. This plow is further equipped with powerful flanges and easily controlled long wings or flukes.

Sweepers in various forms have been in use for years. Many roads still use the rattan sweeper, with its pair of brooms set diagonally across the track, and driven by a motor placed in the cab. These sweepers will remove the snow down to the pavement, if run early and often, but are slow and fail entirely in a great quantity of rapidly falling wet or heavy snow.

Sweepers with steel instead of rattan brooms have been constructed and operated with some success. The advantage of this form of broom is found in its great strength and stiffness. The steel brushes will cut hard snow with great ease, do not bend, break or wear out rapidly. They are only stalled by drifts so high that the brooms cannot throw the snow out of the way. With them a drift may be bucked as successfully as with an ordinary share-plow.

Six years ago the first electric rotary snow plow was put in operation. It was a crude affair, having for its cutting blades a segmental screw, whose front view gave the appearance of a propeller wheel, and back of which was placed an ordinary fan blower with a suitable spout. A pair of light motors were mounted on the shaft in a small car to rotate this screw. A passenger car was used to shove this appliance along, and at the end of the road a pin was pulled and the plow body rotated on its truck, so that the plow pointed in the opposite direction; the passenger car was then placed behind the plow, which proceeded on its journey.

In the following fall the writer built a modified form of this rotary snow plow (under contract with the patentee), having its truck equipped with motors, thereby doing away with the necessity of a pusher. The ease with which this appliance cut through huge drifts, depositing the snow at a distance from the track, led the Buffalo Railway and other companies to construct similar plows, making the plows two-ended: by means of suitably arranged clutches, the blades at either end of the plow may be cut in or out. The cutting blades are also arranged so that they can be given a lead or pitch in either direction, and be rotated right or left-handed. By this arrangement it is possible to always throw the snow in the most advantageous direction. The motor equipment on each plow consists of two 35-hp. motors on the truck and two 35-hp. to 50-hp. motors on the rotary shaft.

A modification of this rotary, intended to

*Read at the convention of the New York State Street Railway Association. Buffalo, Sept. 18, 1900.

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overcome inherent defects in the above described design, has been built at Charlotte. This plow has a twin screw, thereby getting the cutting blades down closer to the rails, and reducing the dead-snow load, which, in the former design, frequently stopped the travel of the plow.

The writer's experience has included work with all of the above-described general types of plows and sweepers.

In the city of Buffalo, situated, as it is, at the foot of Lake Erie, subjected to high winds, and having at all times a more or less humid atmosphere, these plows, rotaries and sweepers are rated and berated by operatives about as follows:

The walkaway is invaluable in leveling back drifts at a distance from the track, opening up gutters and walks, and in performing similar work otherwise requiring manual labor.

The leveler, or windsplitter, as it is here called, has no excuse for existing, beyond that of furnishing something to run through the streets when all the plows are crippled and in the shop.

The electric leveler leaves a beautifully smooth street, cleans close to the rail, but is no good when snow falls 6 inches an hour, for 6 inches of ordinary snow stalls it, unless a pusher is used. It can seldom be operated during the day with less than five men, and usually requires six or eight.

The heavy share plow, with compression flangers, high-curved shares, long, heavy wings or flukes and powerful motors meets all city conditions well. It fails between high, frozen drifts close to the track, and in cuts on suburban lines, because it has then no place to shove the snow, and, when built for double track, unless weighing over 19 tons, is liable to shove off the track in a hard-packed drift.

The rotary is of value in keeping lines open during a heavy fall of snow, through high snowdrifts and at times when all other plows fail.

It does not easily handle very wet snow, unless equipped with powerful motors. Its present design is faulty, but the faults might easily be overcome in new machines. In heavy work it must be moved slowly, with the fans rotating at very high velocity. It is an invaluable part of our snow plow equipment.

The rattan sweeper in this climate is too slow and expensive in maintenance. After trying one under varying conditions we have concluded that it is not for us, nor we for it.

The steel-broom sweeper ranks next the rotary. It cannot work as well in deep drifts, but excels in hard packed or wet snow. It frightens horses, and, therefore, is not used during the day in the business districts of the city. When these steel broom sweepers were built, W. P. 50 motors were the latest type out. These plows have therefore been equipped with these motors, and as a result made frequent visits to the repair shop. Hereafter these sweepers will be equipped with G. E. 1,000 motors, and will be expected to give more reliable, if not more satisfactory, service.

Anticipating your question, the snow plow equipment of the International Traction Company's interests consisted last winter of: One McGuire sweeper, two T. H. steel broom sweepers, one single-end rotary, eight double-end rotaries, seven heavy share plows, Buffalo pattern; two Taunton share plows, one Brill share plow, sixteen electric levelers, ten trailer levelers, ten walkaways. This equipment operated over 190 miles of track in Buffalo, 18 miles in Niagara Falls, 5.50 miles in Lockport, 10 miles in Tonawanda, 56.50 miles of suburban and interurban track, a total of 280 miles of track.

The organization for the removal of snow and ice in Buffalo covered 190 miles of city track, and 30 miles of suburban track.

The Buffalo snow plow equipment consists of: Four rotary plows, three sweepers, fourteen electric levelers, ten share plows, seven trail levelers (in reserve), seven walkaways.

Giving an average of one snow plow for each 5 miles of track, or one heavy plow and one light plow for each 13 miles of track.

The superintendent was the head of the organization. The assistant superintendent and the assistant engineer of the way acted as aids, each supervising the operation of one-half of the territory, which was further divided into twelve districts. Each district was under the personal supervision of an inspector. Each inspector controlled two or more snow plow crews, under a captain, and one or more gangs of shovelers, under a track foreman. The general track foreman had immediate charge of all shovelers, arranged their reliefs, furnished extra men and emergency aid of all kinds, and in all cases working with the district inspector.

By means of a private telephone exchange the two aids and the general track foreman, the superintendent kept in communication with the plows and men on each line. Inspectors reported by 'phone hourly, when possible, and in all cases kept the superintendent informed of their movements and the condition of their lines. The snow plow captains reported each time they passed a company telephone and otherwise from a public telephone, in case of accident to their plows, or when in need of aid.

At the first sign of a storm all snow plow crews, track shovelers and switch cleaners reported at the designated headquarters of their district. The walkaways and teams, with sleighs, were subject to the call of the inspectors through the superintendent. They were sent to the various districts as required, the foreman of teams supplying from outside sources the additional teams and sleighs required, arrangements for which were made before the first snow fell.

The inspectors, upon approach of a severe snow storm, saw that the snow plow crews were on hand, and if necessary, reduced the passenger car service to give the plows ample power and aid.

In case the snow plow equipment in a district was insufficient to insure the continuance of service on any line, aid was at once obtained from some neigboring district, instructions being transmitted by telephone or by one of the aids to the districts affected.

The aids and the general foreman were supplied with horses. During severe storms the instructors of motormen and conductors and clerks in the superintendent's office acted as special messengers, and when required, assisted the inspectors in operating the passenger cars and acted as substitute inspectors while the inspectors were resting.

Last winter's severe storms proved a hard test of snow fighting appliances generally, and Buffalo's experience satisfied the management, as well as the operatives, that one-half the equipment was useless in emergency, and that the traction of all plows should be increased, that each type of heavy plow, sweeper or rotary has its place, and is of value to the company only when given the class of work for which it is designed.

THE THREE-IN-ONE LAMP.

A lamp has recently been placed on the market by the American Lamp and Brass Company

FIG. 1.

of Trenton, N. J., which is unique and embodies features that are much to be desired. The

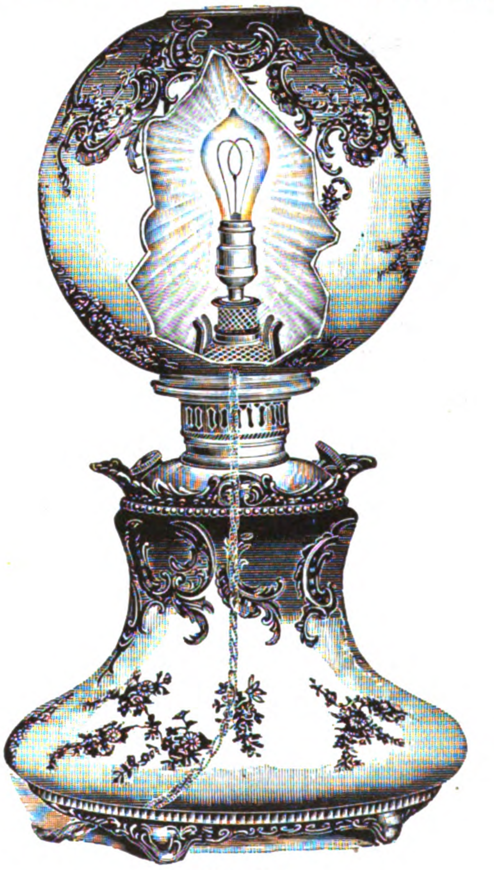

FIG. 2.

lamp referred to, known as the Three-in-One lamp, and shown in the accompanying illustra-

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tions, permits of either electricity, gas or oil being used. Fig. 1 is a view showing the oil pot, burner and other parts as adapted for either oil, gas or electricity. Fig. 2 shows a lamp fitted for electricity in use, with a portion of the globe cut away. In Fig. 3 may be seen a lamp in which either oil or gas may be used. The peculiarity and great advantage of this lamp is that it can always be used for any of the three illuminating agents almost instantly so far as the lamp is concerned. If for oil it is only necessary to fill the fount. When gas is used connection is made with a gas burner or chandelier by means of a flexible tube and goose neck, the tube being passed up through the center of the oil pot and a special burner provided with a flame spreader different from the one ordinarily used with oil. The regular flame spreader of the oil lamp is removed and the gas attachment alluded to screwed on to the top of the gas tube when the lamp is ready for use. When electricity is to be used wires are connected with an electrical current and an incan-

FIG. 3.

descent lamp is attached. For gas it can be used with either an ordinary or Welsbach burner. These lamps are regularly made in a line embracing about 50 styles with hand-painted decoration varying in price from $12 to $30 each. Another line is handsomely decorated, but not hand-painted, varying from $1.50 to $15 each. In this connection they put up a combination of Three-in-One lamps each complete with 6 feet of rubber tubing, goose neck, burner, mantle and chimney, packed four in a case, having two distinct decorations, and are sold at $5 each, allowing but one package of four to a customer. This, it is said, practically gives the Three-in-One outfit gratis, as it is only the normal price of the lamps.

PERSONAL MENTION.

Mr. L. W. Gill, B. A. Sc., of Montreal, has been appointed lecturer in the newly created chair of electrical and mechanical engineering in the Kingston (Ont.) School of Mining.

Mr. Daniel M. Hall has assumed the management of the Rome (N. Y.) Home Telephone Exchange.

Mr. J. M. Jeffers, president of the Montrose Electric Light Company of Scranton, Pa., is perfecting arrangements by which the exhaust steam from the electric light plant will be utilized to heat the court house, school building and several business houses.

INCORPORATIONS.

The Chicago Motor Vehicle Company, Harvey, Ill. Capital stock, $1,000,000. Incorporators: H. W. Kellogg, W. C. Worth and W. B. Donaldson.

The Harding Incandescent Company of Illinois, Chicago, Ill. Capital stock, $250,000. Incorporators: A. L. Ringo, Gottlieb F. Mayrer and C. Knox Harding.

The Turtle Creek & Millerstown Street Railway Company, Harrisburg, Pa.—to construct and operate an electric railroad. Capital stock, $6,000. Incorporators: R. W. Williams, C. B. Wilson, W. F. Kimmick, J. W. Johnston, J. R. Montgomery, all of Turtle Creek.

The Electric Safety Traction Company, Boston, Mass.—to build and equip railways. Capital stock, $5,000,000. Incorporators: B. Gibby of Malden, L. Dixon of South Farmington, C. K. Corsant of Cambridge, S. D. Butterworth, Jr., and J. P. Swift, both of Boston.

The Lackawanna & Wyoming Valley Rapid Transit Company, Camden, N. J.—to operate transportation railways and to produce compressed air and electro-motor force. Capital stock, $2,850,000. Incorporators: F. R. Hansell, George H. B. Martin and William F. Eidell.

The Whitehall Gas & Electric Company, Whitehall, N. Y. Capital stock, $50,000. Directors: Thomas S McLaughlin, William S. McLaughlin and Brackett W. Burleigh, Whitehall; Oscar B. Weber and Edwin E. Wetherby, New York City.

The White Motor & Machine Company, Waltham, Mass. Capital stock, $25,000.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED OCTOBER 30, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

660,738. Third Rail for Electric Railways. Benjamin C. Seaton, St. Louis, Mo., assignor of one half to Benjamin Eiseman, same place. Filed March 5, 1900.

630,779. Fender for Trolley-Cars. Lajos Madas, New York City, assignor of one-half to Adolf Stern, same place. Filed Aug. 17, 1900.

661,020. Electric Railway System. Byron E. Osborn, Anburn, N. Y. Filed Aug. 5, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

660,795. Electric Arc Lamp. Charles E. Harthan and George E Stevens, Lynn, Mass., assignors to the General Electric Company of New York. Filed Nov. 2, 1898.

660,852. Electrode for Arc Lamps. Frederick Hachmann, St. Paul, Minn., assignor of three-fourths to Louis Hill and Max Toltz, same place, and Elizabeth Baasen, Milwaukee, Wis. Filed Dec. 22, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

660,561. Electric Indicator. Charles L. Clarke, Rye, N. Y. Filed July 10, 1900.

660,713. Electric Motor. Thomas S. Watson, Milwaukee, Wis., assignor to the Browning Manufacturing Company, same place. Filed Oct. 4, 1899.

660,724. Electric Conveying and Elevator Apparatus. George K. Fischer, Salt Lake City, Utah, and Frank Klepetko, Great Falls, Mont. Filed Aug. 24, 1899.

660,803. Measuring Instrument. Franz Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago Ill. Original application filed Sept. 2, 1899. Divided and this application filed Feb. 12, 1900.

660,804. Measuring Instrument for Alternating Currents. Karl O. F. Schrottke, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Sept. 2, 1899.

660,818. Electric Switch. Charles H. North, Cleveland, O., assignor to the North Electric Company, same place Filed Nov. 15, 1899.

660,820. Magneto-Electric Generator. Charles H. North, Cleveland, O., assignor to the North Electric Company, same place. Filed Aug. 24, 1900.

660,907. Single-Phase Alternating-Current Generator. Benjamin G Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania Filed May 24, 1899.

660,908. Variable-Speed Electric Motor. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed June 5, 1899.

660,909. Electric Motor. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Sept. 14, 1899.

660,911. Alternating Current Induction-Motor. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed April 14, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

660,572. Telephonic Apparatus. Raimund Gunther, Vienna, Austria-Hungary. Filed Nov. 18, 1898.

660,796. Hygienic Resonator for Telephones or Other Sound-Transmitting Devices. Gustavus Hoglund and Carl M. Hedman, Chicago, Ill., assignors of one-half to Charles Berg and Maurice Lundin, same place. Filed Dec. 18, 1899.

660,802 Telephonic Apparatus for Use on Vessels, etc. Mario R. D'Asar, Genoa, Italy. Filed Feb. 28, 1899.

660,826. Telephone Call Recorder. Harold D. Stroud, Chicago, Ill., assignor of one-half to James E. Plew, same place. Filed Feb. 23, 1900.

MISCELLANEOUS.

660,551. Electric Fan. John T. Beswick New York City. Filed May 8, 1900.

660,613. Process of Amplifying Electric Currents. Joseph B. Baker, Newton, Mass. Filed Nov. 23, 1899.

660,618. Device for Truing Commutators. Percy B. Bosworth, Akron, O., assignor of one-half to Frank G. Carnahan, same place. Filed Aug. 10, 1900.

660,620. Non-Interference Signal Box. Frederick W. Cole, Newton, Mass., assignor to the United States Fire and Police Telegraph Company, Boston, Mass. Filed Nov. 13, 1899.

660,633. Electric-Snap-Switch Cover. Monroe Guett, Hartford, Conn., assignor to the Hart & Hegeman Manufacturing Company, same place. Filed June 27, 1900.

660,634. Rotary Snap Electrical Switch. Monroe Guett, Hartford, Conn., assignor to the Hart & Hegeman Manufacturing Company, same place. Filed June 27, 1900.

660,741. Appliance for Making Metallic Connections Between Electric Conduits, Alfred W. Watkins and Rudolpf Lenk, New York City. Filed March 13, 1900.

660,801. Electrically-Operated Machine-Tool. John Riddell, Schenectady, N.Y., assignor to the General Electric Company of New York. Filed Aug. 30, 1900.

660,810. Coin-Controlled Mechanism. Frank P. Cox, Lynn, Mass., assignor to the General Electric Company of New York. Filed April 8, 1899.

660,815. Electric Distribution System. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 28, 1900,

660,816. Producing High Vacuums. John W. Howell, Newark, N. J., assignor to the General Electric Company of New York. Filed Aug. 31, 1899.

660,819. Magnetic Signal. Charles H. North, Cleveland, O., assignor to the North Electric Company, same place. Filed April 21, 1900.

660,836. Electrogalvanic Battery. Horatio J. Brewer, New York City. Filed July 7, 1899.

660,857. Electromagnetic Tooth-Stopping Hammer. Curt Ostmann, Breslau, Germany. Filed June 5, 1899.

660,878. Insulating-Support for Switchboard-Conductors. Gilbert Wright and Christian Aalborg, Wilkinsburg, Pa., assignors to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Jan. 2, 1900.

660,884. Metal-Depositing Apparatus. Hermann R. Boissier, New York City. Filed April 4, 1900.

660,887. Screw Electric Contact Device. Charles Chevallier, St. Quentin, and Eugene Cadet, Peronne, France. Filed Jan 5, 1900.

660,910. System of Electrical Distribution. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed April 14, 1900.

660,930. Method of Varying Active Lengths of Electrical Conductors. Charles F. Scott, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Aug. 21, 1897.

660,979. Electric Accumulator or Secondary Battery. Henri Weymersch, Paris, France. Filed Feb. 19, 1900.

660,987. Electricity-Meter. Paul Eibig, Berlin, Germany, assignor to Martin Behrendt, same place. Filed Oct. 7, 1899.

DESIGN.

33,466, Electric Bicycle-Lamp. Alexander C. Proudfit, Boston, Mass. Filed Oct. 2, 1899. Term of patent 14 years.

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THE TELEPHONE WORLD.

Nickel-in-the-Slot Telephone.

A telephone company of Cleveland has succeeded in constructing an automatic telephone attachment, which it asserts, after months' of experimenting, it has found no method of "beating." The instrument has been adopted by the United States Telephone Company, and will soon be installed in a number of its long-distance pay stations throughout Ohio. There are four slots in the machine, one each for 5, 10, 25 and 50 cent pieces. When a five cent piece is dropped into its proper slot, one tap on a bell is heard by the central operator; and the use of the 'phone is limited to the amount of talk that sum will buy. A ten cent piece causes two taps on the bell, a twenty five cent piece one tap on a gong, and a fifty cent piece two taps. To use the telephone a lever at the side of the box is turned, and the coin placed in the appropriate slot.

Arrangements have been made to put in a telephone service in the Philippine archipelago. The Lambert Schmidt Manufacturing Company of Weehawken has been awarded a contract to supply $10,000 worth of telephone instruments and to ship them to Manila as soon as possible. The Government plan is to have the telephone service extended, not only throughout Luzon, but to connect Manila with as many other islands as possible

The Hagerstown (Ind.) Telephone Company has now completed its line to Economy, and branch lines are extended into every community around that town. Nearly every farmer has a box in his house, and it is said there is not a neighborhood in Wayne County that cannot be reached by every subscriber from his own home.

There is a movement on foot in Spencer, Mass. to start a rival telephone company to compete with the New England Telephone Company. Several business men are interested in the new scheme. It is stated that a company is willing to do business in Spencer, if 100 subscribers are secured The rate will be much less, it is claimed, than the present rate charged by the New England people.

The Athens (Tenn.) Telephone Company has just completed putting in a new system, and Athens now enjoys a complete and up-to-date line. The local system is connected with the long-distance and those having local 'phones do not have to leave their place of business to converse with any section in the country tapped by the American Telephone Company. It is a great convenience and help to the patrons of the local system.

The Anderson County (Ky.) Telephone Company, having won its franchise suit against the East Tennessee Telephone Company, is preparing to erect its lines throughout the county, thus connecting remote points of the county that have hitherto been without quick communication with the county seat.

Yazoo City, Miss., now has direct communication by telephone with Kosciusko, at which place good connection is made with Carthage, in Leake County, Starkville and other towns in East Mississippi. This is the result of the completion of the telephone line from Kosciusko to Ebenezer, Miss.

Wire thieves have been making things interesting for the Wisconsin Telephone Company. Three times within a few days the toll lines running out of Milwaukee have been cut, and large quantities of wire stolen. The lines were cut between Milwaukee and Waukesha and Fond du Lac.

The Bell Telephone Company of Kokomo, Ind., has reduced the residence rate to 50 cents a month on monthly contracts. The old rate was $2, which the new company met with a $1.25 schedule.

The Sioux Rapids (Ia.) Telephone Company is at work installing a complete local system. The company is composed of C. B. Mills, T. Tymeson, R. G. Hulett and P. J. Cilley, representative business men, and will begin business under favorable circumstances.

The long distance telephone line which is being constructed across the State of Washington, has reached Ellensburg. This system will be completed shortly.

Work on a new telephone line between Grand Rapids and Marshfield, Wis., has been commenced, It will be rushed and the line completed before December 1.

D. N. Tallman, president of the Minnesota Central Telephone Company, has completed a local telephone exchange at Raymond, Minn., with 28 local telephones.

The Cumberland people are at work erecting the poles and telephone ines for a local exchange in Crowley, La.

A Loud Speaking Telephone

Mr. Gregor Blanck, the Hungarian, who has invented a loud-speaking telephone, is at present in London negotiating with the British Postoffice and the National Telephone Company for the introduction of his instrument upon their system. The Postoffice has informed the inventor that if he can construct an instrument with which it will be possible to telephone a distance of about 1,000 miles with ease and without having to shout into the instrument, so that the words may be distinctly distinguished at the other end, they might be disposed to avail themselves of the invention. The inventor has been busily engaged upon a machine for this purpose, and by the aid of a very powerful inductive coil has succeeded in telephoning over a distance of 1,000 miles, and will shortly experiment with his improved instrument before the authorities of the postal department. The crux of the invention is that by means of the coil, articulation of the speaker is intensified as the words pass along the wire. Besides connecting the instrument with the telephone, the inventor will attach it to the electrophone, and by this means one will be able to sit in a room and listen to what is happening in a theater without having to insert the tubes into the ear, as is now necessary. The sounds would proceed from the electrophone in much the same manner as they are recited by the phonograph.

The Home Telephone Company of Lockport, N. Y., has begun work on its pole line for an exchange in that city. About twenty car loads of cedar poles have arrived, and will be rapidly set throughout the city. The service will be a copper metallic one, with no party lines. It will compete with the Bell Company, which has many ground and party lines still in use there. The local company will also build a toll line to Niagara Falls and Tonawanda, to connect with the local independent exchanges already in operation there. The new company is being cordially indorsed by the public.

Arrangements are being made in Charleston, S. C., to connect that city with all the sea islands lying thereabouts. Four submarine cables will be laid and the system will connect all the section with the long distance service. This system will be constructed by the Gordon Telephone Company, and controlled jointly by this company and the Sea Island Telephone Company, recently organized in Charleston. The Gordon Company entered the field against the Bell Company, and beat the Bell in the rush for the sea island connections, which will mean a heavy business. The Gordon will also have long distance lines, connecting with Columbia, S. C., Atlanta and Augusta, Ga. The intermediate points will be switched on, and the company will cut into the territory now held exclusively by the Bell Company.

A contract has been circulated among the physicians of Knoxville, Tenn., relative to the telephone war. As a result, it is claimed every physician, with the exception of a very few in that city, signed an agreement to use no other instrument in their offices for one year than that of the People's Telephone Company, at the rate which is now being charged. This action has been taken because the old 'phone company—the Cumberland Telephone Company—has increased its rates. The new or People's Telephone Company has bound itself in the contract not to increase rates for the specified time. There is much feeling existing in the city over the increase in rates for the old 'phones.

At a recent session of the council of Oklahoma City, Okla., an ordinance was passed granting the use of the streets to the Citizens' Independent Telephone Company for the period of twenty-one years. The council fixed a forfeit of $500 if the company does not accept the ordinance and complete the work within eight months. The company accepted the franchise, and the work will commence in about thirty days. The estimated cost of the exchange will be $30,000.

A telephone war threatens St. Johnsbury, Vt. The People's Company is fast completing its line, and will soon be getting the instruments located. There are over 200 subscribers at a yearly rate of $15, and the Bell people will have to meet this rate and improve its service to hold its subscribers. It is bound to be an interesting fight for the public, as it will lower the rates and better the service.

The Cincinnati Bell Telephone Company has increased its capital stock $1,250,000. Part of the new stock will be issued to stockholders as a dividend at the rate of two for five owned, and $510,000 goes into the treasury for future acquisitions.

Of the total number of telephones and transmitters under rental by the American Telephone & Telegraph Company, the Erie Telephone system on October 1 was using 292,336.

A Notice was recently issued by General Superintendent E. B. Smith, of the Iowa Telephone Company of Davenport, "to the holders of several thousand shares of stock of that company, asking them in accordance with their agreement to exchange their stock for stock in the Central Union Telephone Company and deliver their certificates to the cashier of the Citizens' National Bank. The stock will be receipted for by the cashier, and will be sent to Chicago to be converted into Central Union shares. The latter will be here in a few days and when delivered the Iowa Telephone Company will practically cease to exist. What effect this will have on the future of the Iowa Telephone Company no one here knows. It is understood that a progressive policy will be adopted by the Central Company."

The New York & Pennsylvania Telephone Company is preparing to establish a village telephone system in Dryden, N. Y. All the 'phones will be adapted to long distance service. This will be of great advantage to business men of Ithaca. The Dryden circuit will be under the direction of Manager P. A. White, of Ithaca. The company is also about to install similar systems in Groton, Freeville and Trumansburg in this State.

The contract has been let by the West Des Moines, Ia., school district to the Mutual Telephone Company of Des Moines to enlarge its service to include all the school buildings of the consolidated district. The company may have to put in a new switchboard in the office of the superintendent to accommodate the wires from the additional schools.

The rehearing of the case of the Northwestern Telephone Company against the city of Minneapolis, Minn., in the Supreme Court, has been put over from October 27 to November 29. It was the counsel for the telephone company that asked for more time.

President John M. Clark, of the Chicago Telephone Company, says recent tests show that operators answer calls from subscribers on an average of a little over six seconds from the time they are sent in and that it is expected to get the record down to four seconds before long.

The Paris (Ky.) Telephone Company, organized in Paris six years ago by local capitalists, has been purchased by the Columbian Telephone Company of Nashville, Tenn., which recently bought the East Tennessee system. The price paid has not been made public.

The case of the Southern Bell Telephone Company vs. the City of Richmond, Va., is not likely to be argued before the United States Supreme Court before next spring. It has been docketed for hearing. The Court is now in session and will remain in session until next May.

The business men of Alcester, S. D., are arranging for the establishment of a local telephone system.

The telephone line from Plantersville to Anderson, Tex., opened for business a short time ago. This puts Navasto, Tex., in immediate touch with every town and postoffice in Grimes County except three, but telephone lines will soon be built to these towns.

TELEPHONE INCORPORATIONS.

The Buchanan County Telephone Company, Independence, Ia.—to do a general telephone business. Capital stock, $50,-000. Incorporators: W. F. Roney, M. W. Harmon, J. F. Van Voss, C. E. Ransier, C. F. Bennett, all of Independence.

The Audubon County Telephone Company, Audubon Ia.—to do a general telephone business. Capital stock, $25,000. Incorporators: F. P. Hocker, W. B. Swaney, both of Audubon.

The Citizens' Telephone Company, Shelbyville, Tenn. Capital stock, $10,000. Incorporators: J. D. Hutton, S. J. McGrew, W. G. Evans, J. B. Frierson, Richard Sandusky, R. P. Shapard and Ernest Caldwell.

The Remsen & West Canada Creek Telephone Company, Remsen, N. Y. Capital stock, $2,000. Directors: G. E. Pritchard, Remsen; T. E Dunn, Port Leyden and C. C. Bullock, Northwood.

The Campbell & Rising Ville Telephone Company, Campbell, N. Y.—to connect with the villages of Thurston and Rising Ville. Capital stock, $1,000. Directors: Charles S. Smith and Clarence N. Risley of Campbell, and Emerson J. Jerry of Rising Ville.

The Monmouth Telephone Company, Monmouth, Ill. Capital stock, $25,000. Incorporators: Howard M. Carter, Sidney W. Worthy and Arthur Dyrenforth.

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GENERAL ELECTRICAL NEWS.

Lighting.

Allegheny, Pa.—The Turtle Creek Electric Light Company has recently been formed here.

Arcadia, Ind.—The citizens of this town are agitating the question of electric lights.

Arcanum, O.—The Union City Company contemplates asking the council for an electric light franchise and contract for lighting the town.

Athol, Mass.—The Athol Street Railway Company has purchased land and water rights on Miller's River and will erect an electric light plant.

Braymer, Mo.—This place is working for electric lights.

Cambridge City, Ind.—The city authorities are endeavoring to build an electric light plant and pay for it in monthly installments.

Forreston, Ill—An electric light plant will be built here, which is to be completed by January 1.

Franklinville, N. Y.—It is stated that the electric light plant here is for sale.

Gaffney, S. C.—The citizens of this place recently voted for an additional issue of $15,000 of bonds to increase the electric light and water facilities.

Gastonia, N. C.—The Southern Railway Company of which F. S. Gannon, of Washington, D. C., is manager, will build a new depot at Gastonia to be equipped with electric lights.

Greenville, Ala.—This city contemplates the issuance of bonds for the purpose of erecting an electric light plant. C. E. Hamilton, mayor.

Green Cove Springs, Fla.—The Magnolia Hotel Company will install an electric lighting plant.

Hawkensville, Ga.—T. H. Grace, mayor of this city, wants prices on a complete outfit of electrical machinery for operating 40 arc and 1,500 16-candle power lights.

Kilbourn City, Wis.—The Kilbourn Machine Company has been granted a franchise for electric lights for the village.

Kokomo, Ind.—This city is making an effort to purchase the electric light and water plant at a cost of $80,000.

Lincoln, Neb.—A special committee has been appointed to secure estimates on the cost of putting in an electric lighting plant to be owned and operated by this city. Address Mayor Winnett.

Mattoon, Ill.—An explosion wrecked the electric light power house here causing $10,000 damage.

Monroe, Ga.—This city is negotiating for the purchase of an electric light plant here, and if not successful may construct a municipal plant.

Naperville, Ill.—An addition is to be built to the Naperville electric light plant. O. W. Strubler, city clerk.

Newbern, N. C.—Simmons & Hollowell Company of this place want estimates on the cost of dynamos and lamps for lighting.

New Baltimore, Mich.—The citizens of this place voted a short time ago upon the question of bonding the village for the purpose of establishing an electric lighting plant.

New Iberia, La.—M. T. Lewman & Co. of Louisville, Ky., has been awarded the contract for the erection of a new electric light plant here.

Oklahoma, Okla.—The electric light company of this place is putting in twenty miles of wire for the new street lights.

Orlando, Fla.—Bids are advertised for lighting this city with electricity.

Pewaukee, Wis.—A movement has been started to erect an electric light plant in this place.

Port Austin, Mich.—The citizens of this place have decided to issue bonds for $15,000 for the purpose of erecting an electric light plant. Bids will soon be advertised for. Address Geo. Murray.

Richmond, Va.—An electric light plant will be erected here to be owned by the city.

Ruston, La.—Bonds to the amount of $25,000 have been sold for the purpose of erecting an electric light plant and water works here. R. M. Adams, engineer, can be addressed.

Shelby, N. C.—The Shelby Electric Light & Power Company, recently incorporated, will build an electric ight and power plant.

Terre Haute, Ind.—The board of trustees of the State Normal School here has decided to ask the Legislature for an appropriation of $9,000 to be used in providing an electric plant for the school.

Tullahoma, Tenn.—The city council will pass an ordinance granting an electric lighting franchise to a private company. Address G. W. Davidson, mayor.

Washington, D. C.—The architects of the Indian office have completed plans and specifications for an electric light plant and wirings for the Chilocco Indian School near Arkansas City, Ark. Bids will soon be advertised for.

Street Railways.

Allegan, Mich.—Surveyors have been at work on the route of the proposed electric railway from here to Jamestown, which will connect with the Grand Rapids-Holland Road just begun. M. D. Owen of this city and D. Cornwell of Monterey are the promoters.

Baltimore, Md.—The Druid Hill avenue terminal car shed of the United Railways & Electric Company was lately destroyed by fire. The loss is estimated at about $25,000.

Billings, Mont.—J. McNaught, T. E. Collins and J. R. Haves are the projectors of a new railroad connecting rich mining country between this place and Great Falls, a distance of 200 miles. Articles of incorporation have been drawn placing the capital stock at $4,000,000. The company will employ electric motive power. Two large power houses will be built on the Missouri and Yellowstone Rivers.

Cedarville, N. J.—Nearly everything is now complete for the Bridgeton trolley road to be extended from here to Port Norris, and by spring the line will be run through.

Chippewa Falls, Wis.—The Chippewa Valley Electric Railway is to be supplied with power from the plant of the Chippewa Falls Power & Lighting Company. The railway company's plant in Eau Claire is insufficient to transmit power to drive the large cars up the hills in this city. The company's plant will be equipped with new machinery.

Cincinnati, O.—G. M. Gest, an electric railway builder of this city, contemplates building an electric line between Fulton and Union City, and probably to Tiptonville and Reelfoot Lake.

Easton, Pa.—It is thought that work on the trolley line between this city and Doylestown will be commenced in the near future.

Flint, Mich.—C. A. Beardsley of Detroit, appeared before the board of supervisors here and secured a franchise for the Detroit, Pontiac, Flint & Saginaw Electric Road.

Guadalajara, Mex.—It is rumored here that the street car company is negotiating with a view to providing its lines with electric power and doing away entirely with the horse or mule locomotion.

Matanzas, Cuba.—The municipality of this city at its regular meeting, resolved to receive proposals up to December 15 next for providing the city with electric or gas lighting, and with electric tramways; the proposals can be made to include both services of lighting and tramways or for each separately, the municipality reserving the right to accept or reject any or all proposals; the proposals must adhere to the essential conditions, contained in the specifications, which will be furnished upon application to D. Lecuonia, mayor. The specifications above referred to can also be obtained by applying at the office of Messrs. Jimenis & Co., 114 Wall street, New York City.

Mishicot, Wis.—The people of this and other villages along the proposed electric railway route are well satisfied with the prospect and will lend assistance in the promotion of the line.

Natchez, Miss.—Wilmer H. Shields of this city represents local and foreign capitalists who contemplate constructing an electric line here.

New Orleans, La.—An electric street railway is to be built from New Iberia to Berwick City. The distance of the new line will be 45 miles. A stock company has been organized in this city for the building of the road and Gen. F. F. Myles, 822 Gravier street, is at the head of the project.

Palmyra, Mich.—A franchise was lately granted to A. P. Southworth, as a representative of the Toledo & Adrian Electric Railway, through this village by the township board.

Ripley, O.—The work of securing the right of way for the electric road from this point to Hillsboro began recently.

Stamford, Conn.—A survey is being made for a new trolley line from the terminus of the Stamford road to Glenbrook. Construction work will be begun on the road before the cold weather sets in.

Uniontown, Pa.—The Tennis Construction Company of Philadelphia was recently awarded the contract for building the new electric road of the Uniontown & Monongahela Valley Railroad Company. The tracks will extend through the new Masontown coke fields, making about 20 miles of track.

Weymouth, Mass.—If a franchise is granted by the selectmen a new electric road will be built from South Weymouth to Holbrook, and from that place direct to Randolph and Dedham. The capital stock is $40,000. Drs. C. D. Harlow and G. D. Bullock of this town are on the board of directors.

Manufacturing.

Des Moines, Ia.—This city will probably have a manufactory soon that will make automatic electric switches for use on a street railway. H. S. Butler, general agent for the McCormick Harvester Company, has the matter in charge.

Wellsville, O.—The Modern Engineering Company of this place, has been formed for the purpose of manufacturing and selling mechanical and electrical devices. The capital of the concern is $10,000. The shares are $100 each and are held by Charles R. Dallas, Howard, L. Ken, G. B. Thurber and C. B. Reed, of Pittsburg, and Thomas Charlton, of Chicago, Ill.

Wheeling, W. Va.—T. B. Sweeney, E. M. Holliday, L. F. Stifel, G. Wise, J. L. Dickey and H. M. Russell, all of this city, are interested in a recently organized company, capitalized at $500,000, and known as the Poole Clock Company. The object of the firm is the manufacturing and dealing in electric clocks.

Company Matters.

Alton, Ill.—Trustee G. F. Crowe, for the creditors of the Alton Electric & Service Company, under the chattel mortgage, will sell the property of the company at public sale November 14.

Birmingham, Ala.—The Birmingham Railway, Light & Power Company will issue $1,750,000 in bonds which will be expended in improvements.

Middletown, N. Y.—The annual meeting of the stockholders of the Middletown-Goshen Electric Railway Company has been adjourned until November 15.

Vicksburg, Miss.—The Southern Light & Power Company has been organized with $100,000 capital stock to build, own and control electric light and power plants throughout the South. J. C. Schaefer of Chicago is the president.

Power and Transmission.

Raubsville, Pa.—The new electric power plant here will be completed and in operation by January 1.

San Bernardino, Cal.—The hope of Superior Judge Campbell, in using the waters of Lytle Creek for the generation of electric current is about to be realized and it is thought that before very many weeks work will be commenced putting the plans into execution.

Winchester, Tenn.—The Winchester City Electric Power Plant owned by M. L. McDowell & Sons was recently burned.

Winsted, Conn.—There is talk among some of the business men of this place about constructing an electrical power plant at the foot of the Lake stream near Meadow or Boyd streets.

Automobiles.

Trenton, N. J.—William Howard, the automobile manufacturer, is working on a plan whereby to perfect a racing machine.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.–Nov 3						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1¾ % Q.,	111½	112¾
Allentown Pa.–Nov 3						
Allentown & Lehigh Val. Trac. Co	...	4,000,000	1,500,000	....	–	15
Bridgeport, Conn.–Nov 3:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md–Nov 3						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.–Nov 3						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2½ % Aug. 99,	155½	157
Brooklyn N. Y.–Nov 3:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	229	231
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	60¾	60⅞
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad.......pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.–Nov 3;						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.–Nov 3						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd ...	100	1,500,000	1,500,000	....	87	90
Charleston, S. C.–Nov 3						
Charleston City Ry. Co	50	100,000	100,000	3 % S.	–	..
Enterprise City RR. Co	25	1,000,000	250,000	....	–	..
Chicago, Ill.–Nov 3						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	250	255
Chicago & South Side R. T. RR	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	81	82½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	75	76¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	99	100
Union Traction Ry..........com.	....	1,250,000	624,900	85 %	12½	13½
Union Traction Co..........pref	100	2,000,000	2,000,000	5 % S.	46¼	47
Cincinnati, Ohio.–Nov 3:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.–Nov 3:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102½
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84½
Detroit, Mich.–Nov 3						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.–Nov 3.						
City Railway Co...........com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...........pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $230,100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.
Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.–Nov 3						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	–	–
Holyoke Mass.–Nov 3						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.–Nov 3.						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	–
Indianapolis, Ind.–Nov 3.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	15	18
Lancaster, Pa.–Nov 3						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	–	–
Lancaster & Col. Electric Ry	....	....	87,500	....	–	–
West End Street Railway	....	....	....	....	–	–
Louisville, Ky.–Nov 3:						
Louisville Ry.................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry.................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.–Nov 3						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63⅝	63¾
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct.	186	187
Montreal, Canada.–Nov 3						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	267	297⅝
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	100½
Memphis Tenn.–Nov 3:						
Memphis Street Railway Co	100	500,000	500,000	....	25	–
New Haven, Conn.–Nov 3:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	–
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.–Nov 3						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York–Nov 3:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	158¾	158⅞
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	82	86
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR.........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR.........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	409	419
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109⅛
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.–Nov 3:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	58	59½
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	11½ % A.	16	19
Pittsburg, Pa.–Nov 3:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23	23½
Consolidated Traction Co.......pfd.	50	9,478,850	9,000,000	3 %, Nov.	61⅜	62⅛
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72½	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	8½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000	‖2,994,889	2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000	3,000,000	5 % A., June	..	..
United Traction Co..........com.	50	17,000,000	17,000,000	J. & J.	14	14½
United Traction Co..........pref	50	3,000,000	....	J. & J.	51⅜	51⅝

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for $145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Nov 3						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Nov 3						
Northampton Street Ry	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Nov 3.						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Nov 3 :						
Paterson v. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Nov 3 :						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Nov 3						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co..... $12½ pd	50	30,000 000	29,980,450	....	36⅞	37
*c*Electric Traction Co	50	....	8,297,920	....	--	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90⅛
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
*j*Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
*i*Continental Pass. Ry.....guar..	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	--
*j*17th & 19th Sts. Pass. Ry. guar	50	....	‖250,000	1½ % S., July, '98.	--	--
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Nov 3						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Nov 3						
*j*Reading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	850,000	850,000	Jan., '98.	138	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Nov 3						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.......com.	50	500,000	500,000	....	20	21
United Electric Ry.......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99.	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	59	--
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—Nov 3.						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16⅛	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Nov 3:						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.—Nov 3						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Nov 3:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Nov 3						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	§ 100¾	102¼
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Nov 3						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	29	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Nov 3:						
*Worcester Traction Co.......com.	100	8,000,000	8,000,000	....	81	32½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Nov 3:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 3						
American Te & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	147	148
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	98	100
New England Telephone Co	..	10,394,600	10,304,600	$1.50 p. sh. Feb	123⅝	124
New York.—Nov 3						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	80¾	81
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Nov 3 :						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94⅛	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 3						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	--
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	142	142⅛
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	28
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,053	1¾ % Q., Jan.,	62	63
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Nov 3						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co.......com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	--	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	142	142⅛
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Nov 3						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	800,000	800,000	Q	--	--
Philadelphia, Pa.—Nov 3						
Edison Electric Light Co	100	2,000,000	......	......	144	144⅛
*Electric Storage Battery Co..com.	100	8,500,000	......	......	65	75
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	65	75
Northern Elec. Light & Power Co..	10	550,000	550,000	......	18	18⅛
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Nov 3						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	2% Q	‡ 198	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	183½	185
Thomson-Houston Welding Co	100	......	......	8 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Nov 3:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Nov 3.						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co.......pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Nov 3						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	2⅜	2⅝
United Gas Improvement Co..scrip.	50	10,000,000	......	---	..	102
Welsbach Commercial Co.....com.	100	8,500,000	......	---	20½	21⅛
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	48	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1⅛
Pittsburg, Pa.—Nov 3:						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Nov 3:						
*Barney & Smith Car Co.......com.	100	......	1,000,000	---	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	32	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co	100	....	....	---	105	109
*Pratt & Whitney Co..........com.	100	......	....	---	2	4
*Pratt & Whitney Co..........pfd	100	....	......	---	40	50
Stillwell-Bierce Co...........com.	--	....	....	---	--	50
Stillwell-Bierce Co...........pfd	--	....	....	2 % Sept 1, '99.	50	65
Shultz Belting Co	100	500,000	....	....	88	90
St. Charles Car Co	--	....	....	---	80	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation –Nov 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1937	J. & J.	117½	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*126	127½
‡Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation –Nov 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	..
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	. ....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	.. .	....
†Charleston City Ry............1st mtg. 6s.	350,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T............ 4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	.	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	106	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	......	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	531,000	531,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation– Nov 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,835,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation–Nov 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR–1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5s	100,000	24,000	1912	M & S	......	....

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	10?½
Broadway & 7th Ave...........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500.000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000.000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700.000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1908	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100.000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200.000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	300,000	300,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	......	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation–Nov 3 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	..
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.	....	.

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry......................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	... .	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry..............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co...............Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation–Nov 3 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	375,000	375,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	.
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co.....................5s.	2,500.000	2,033,005	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	.....	....

Providence R. I.

Date of Quotation–Nov 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation–Nov 8, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.–1st	1 000 000	000 000	191	J&	17	

*With interest. *Unlisted.

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	B'd.	Asked.
St. Louis.						
Date of Quotation— Nov 3, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co.....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100¼
Union Depot RR. Co........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co. ‡Controlled by Union Depot RR. Co. ¶Controlled by Lindell RR. Co. ‖$200,000 in escrow to retire 1st & 2d mtg. §$600,000 in escrow. ††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation— Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Nov 3, 1900.						
Belt Ry. Co.............................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................1s mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home.1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg.bds.						
Miscellaneous.						
Date of Quotation— Nov 3, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,866,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	8,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds. ‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co. ¶$760,000 in escrow to retire bonds of C. St. RR. Co. ‖$87,000 in treasury. §$960,000 res'ved to redeem prior liens. ††$620,000 in escrow.						
					*With int'res	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Authorized.	Issued.	Due	Interest periods.	B'd.	Asked.
Boston, Mass.						
Date of Quotation— Nov 3 1900.						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation— Nov 3, 1900						
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Nov 3, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	......	124	......
Edison Elec. Illg. Co. (Brooklyn)........	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	......	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	B'd.	Asked.
Miscellaneous.						
Date of Quotation—Nov 3. 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co.................7s.	....	......	....	......	....	......
N. Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	B'd.	Asked.
Miscellaneous.						
Date of Quotation—Nov 3, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co................	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co..........................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

A Pittsburg, Pa., syndicate it is stated has bought the street railway system in Guadalajara, Mexico.

A Philadelphia paper states that Philadelphia Electric is being quietly absorbed by strong interests.

The Whitehall Gas and Electric Company has been incorporated at Albany, N. Y., with a capital of $50,000.

The stockholders of the Third Avenue Railroad Company, New York, will hold their annual meeting on November 14.

October gross earnings of the Easton, Pa., Consolidated Company's electric railway lines were $18,810, an increase of $2,840 over the same month last year.

The Welsbach Incandescent Gas Light Company of Philadelphia has declared a dividend of 5 cents per share, payable November 20, as registered November 1.

The Consolidated Traction Company of Pittsburg has declared a semi-annual dividend of 3 per cent. on its preferred stock, payable November 15 to stock of record November 6.

The New York Vehicle Company has taken possession of the plant of the Worcester Cycle Company, at Hartford, Conn., and will fit it up at once for the manufacture of automobiles.

At the meeting of the bondholders of the Newburgh (N. Y.) Electric Railway Company on October 25 a committee was appointed to consider and report to the bondholders at a subsequent meeting.

Officers of the Chicago Union Traction Company have decided to discontinue the publication of monthly reports of earnings, which began with their control of the North and West Chicago lines a year ago last July..

It is believed in usually well-informed quarters that in less than 30 days President Rossiter of the Brooklyn Rapid Transit Company will be succeeded by a Chicago man hitherto employed by the Whitney-Widener-Elkins contingent.

Chief Engineer Parsons of the New York Rapid Transit Commission has suggested a change in route of the Rapid Transit tunnel to pass under Forty-sixth street instead of Forty-second, from Park avenue to Broadway. The New York Central officials are considering the original plan of running the tunnel under the Grand Central depot.

Russell Sage and other authorities on elevated railroad affairs laugh at the report published recently to the effect that the Manhattan Elevated Company had failed to secure a right to lay conduits from its new power house across New York City to the several elevated lines to carry its electric power on the substitution of such power for steam. They simply say that all those details have been duly considered and provided for and reports to the contrary are purely sensational or for stockjobbing purposes.

The United Electric Company, of Toronto, Ont., successors of the Toronto Electric Motor Company and the Johnson Electric Company employs four times as many men as the two former companies did five years ago. The company has enlarged its premises three times during the past five years, and is now considering the doubling of its present plant. Evidence that the Canadian manufacturers have faith in the permanency of the present prosperity in Canada, is to be found in the fact that the company is installing many electric plants in factories for lighting purposes.

At a meeting of directors of the Boston Elevated Railway Company last week a statement was laid before the directors showing gross earnings for the year ended Septemper 30 of nearly $10,150,000. The company carried in round numbers 250,000,000 passengers, of which nearly 50,000,000 were free transfers. Earnings for the year ending September 30, 1899, were $9,671,440, an increase of $492,344. The increase the past fiscal year was $489,000, or about the same ratio of increase as the year previous. Net earnings for the past year have not been made up. If the same relative increase in operating expenses occurred the past year as in 1899, expenses must have been about $7,000,000, which would leave net earnings of $3,150,000 as compared with $2,844,290 in 1899.

The Athens, Nelsonville & Hocking Valley Traction Company is the name of a corporation which will ask soon to be incorporated under the laws of Ohio. This company has been organized for the purpose of constructing an electric road from Athens to Nelsonville, then to Murray City, the terminus of the road. At Chauncey, six miles north of Athens, a branch will be run to Gloucester by way of Millfield, Jacksonville and Trimble. The line will be 35 miles in length and will thus be connected with all the towns of the Hocking and Sunday Creek Valleys. One of the chief promoters of the electric line is H. H. Haning, of Athens, and he is backed by Dayton capitalists, prominent among whom are Thomas A. Selz, S. R. Pine, H. C. Haning and Robert Klein. The estimated cost of the line is placed at $600,000.

A representative of the leading copper producing interests of the country says: "The copper situation is in an impregnable position. The market is strong at 16¾ cents for both lake and electrolytic. I have never known the situation to be stronger. All the big producers, including the Calumet & Hecla, are sold out of copper. The Calumet & Hecla Co. sold its year's production last September at 16½ cents and it could not sell a pound of copper for delivery this year at any price for it has not got it. The stocks of copper abroad are now down to 21,000 tons, less than a months' production of the mines in the United States, and this copper abroad is of the poorest quality—the remains of the Secretan Corner. The consumption and production of copper are now running hand in hand and the demand is perfectly legitimate for it is apparent that consumers would not purchase copper other than for immediate needs at 16¾ cents. The supply cannot be materially increased for there are no new mines opened up worthy of comment."

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ELECTRICITY.

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EDITORIAL NOTES.

"Electricity's" Educational Series.

Elsewhere in this issue will be found the first of a series of articles of an educational nature, which was referred to in these columns last week. The topic this week is of an elementary nature and is entitled "Electricity and Magnetism."

It is the intention of the author to lead the reader in this series of articles step by step through the elementary stages into the practical application of electricity, so that the worker will, when the series is completed, have a clear idea of the relation of the theoretical to the practical. No mathematical gymnastics will be indulged in, the object being to place before our readers a concise, technically accurate series of articles on electrical subjects that anyone who reads them carefully can understand. We are not trying to educate such men as Nikola Tesla, Steinmetz, Pupin, etc., who, if anything, are overburdened with education as it is, but we are endeavoring to place before the practical worker in the electrical field, who has not had the good fortune or time to take a course in electrical engineering, matter that should prove of use to him in his everyday work and incidentally be a stepping-stone to a more responsible position. If our efforts result in but one electrician being benefited we shall feel repaid.

* * *

Two Automobile Shows.

The cry of "The King is dead, long live the King," might, at the present time, be twisted to "The automobile show is over; hurrah for the automobile show."

The exhibition of automobiles at Madison Square Garden, which began on November 3 and extended through last week, is now over, but the Grand Central Palace is just opening its doors, which will afford automobile enthusiasts a further opportunity of examining and commenting on the various up-to-date types of horseless carriages.

The Madison Square Garden show, which was held under the auspices of the Automobile Club of America, proved most successful, judging from the large numbers of people in attendance nightly. On the opening night the attendance was estimated at 9,000, which demonstrates in a most forcible manner the great interest that is being taken in this comparatively new mode of travel. Incidentally it indicates—what has been known for some time—that the automobile has come to stay.

In the number of the exhibitors, the almost endless variety of motor vehicles shown, in the whole scale upon which the first show of the Automobile Club of America was planned and carried out, there probably has never been its equal, at least not on this side of the Atlantic. More than seventy companies were represented, some from as far West as St. Louis. The exhibitors included manufacturers of the vehicles, makers of tires, and the many accessories of the machines. There were hundreds of vehicles and dozens of varieties, and the total value of them would run into the hundreds of thousands of dollars. The largest thing in the exhibit was a steam-propelled omnibus, weighing 60,000 pounds, with a seating capacity of eighteen. It is understood that a line of these vehicles will soon be operating in this city. Automobile stanhopes, trucks, coaches, victorias and cabs were everywhere in evidence, while, in what used to be the restaurant, could be seen several racing machines—the tricycle which won the Toulouse race in France, the Davis racer, the electric vehicle which won the fifty-mile race on Long Island last summer, and Dr. Lyman's racing machine propelled by gasolene, while in the foyer was the famous racing automobile brought to this country by A. C. Bostwick. This is the machine which won many races in France, and also the championship at the Tri-State Fair in New Jersey.

Among the curios was shown a steam-wagon made for pleasure purposes in 1860 and said to be still in good working order. It was made by Richard Dudgeon in this city, and it is now owned by his son, Frank P. Dudgeon, of Locust Valley, Long Island, who uses it at frequent intervals for the entertainment of his friends. It is practically a locomotive, with a coal-fed furnace, a boiler capable of withstanding 200 pounds pressure and an eight-horse power engine. The obstacle and climbing contests were most amusing and instructive and served to demonstrate that in competent hands the modern automobile is as docile as a well-broken horse.

From now on until November 24 automobile enthusiasts will have an opportunity of comparing the Grand Central Palace show with that recently held in Madison Square Garden.

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Electricity and Fires.

In the issue of ELECTRICITY of July 11, 1900, we referred at some length to the hue and cry that was being raised in some of the daily papers over the large amount of property alleged to have been lost through fires of an electrical origin. At that time it was pointed out that, admitting that many fires were the result of faulty insulation, very frequently a conflagration is attributed to a defective system of wiring when, in reality, some other cause should be sought for. The recent Tarrant disaster has offered an opportunity for this subject to be brought up again, and, in fact, the building was still in flames when it was rumored that imperfect electric insulation was the cause of the fire. Whether this was the cause or not is not definitely known, and probably never will be, and yet we venture to say the fire will go on record as being one of an electrical origin.

When a fire does occur through a fault in the insulation of an electric light or power-wire the responsibility does not rest with the manufacturer of that wire, nor, as a rule, with the contractor who installs the system. When the system is turned over for use it may be in every respect perfect, and in nine cases out of ten it is. It is after the system has been in use for some time that a defect becomes apparent, and in most instances it will be found that this defect is caused by someone—not the contractor who installed the system—driving a nail through the insulation, or to the gnawing of rats, friction against a rough surface, or some similar unforeseen circumstance. Of course, where the wires are run in armored ducts the chances of damage are lessened, but some portions of the wiring are necessarily unprotected, and it is usually in such lengths that the damage occurs. This, then, indicates what we have pointed out time and again in these columns—the crying need of competent municipal inspection. A system of wiring may be electrically sound in every respect to-day, and through carelessness or what not, imperfect in a week, and if no inspector turns up to examine and find the fault no one is the wiser until a fire results. Then the dailies are afforded another opportunity of coming out with articles headed the "Danger of Electricity."

* * *

New York's Rapid Transit System.

Now that the Metropolitan underground railway of Paris after four years' of actual work is an accomplished fact, and now that English, German, French and American electrical concerns are, figuratively speaking, falling over themselves in an endeavor to secure the $25,000,000 contract for converting the motive power of the London Metropolitan District Underground Railway from steam to electricity, a few words regarding the progress that is being made on the underground rapid transit system in this city would seem in place.

After several years of uncertainty and red tape the contract for the construction of the rapid transit tunnel in New York was let about eleven months ago and work was seriously begun in April. The preliminary work consisted in removing, or rather changing, the course of innumerable water-mains and sewers. Then the work of excavating was actually begun at a point far up-town and in the lower portion of the city. The amount of money it will cost to build the completed tunnel is approximately $35,000,000, while the work already done is represented by $500,000, this sum having recently been paid to the subway contractor by the city controller.

The process of changing the water-mains and sewers is necessarily a slow one, and there is no doubt that as soon as this arduous preliminary work is accomplished the construction of the tunnel proper will be pushed forward at a very rapid rate. It has been fondly hoped that at least one section of the system would be in running order in three years, but judging from the many obstacles being met with it will be nearer five years than three before the citizens will enjoy the privilege of being taken home through the tunnel. That delays are inevitable is forcibly demonstrated in the stand just taken by the city authorities on the subject of pipe galleries under new Elm street. The plans called for suitable pipe and sewer galleries along the new Elm street part of the underground railway route, and at the eleventh hour the chief engineer of sewers of Manhattan Borough places his veto on the scheme with the statement that were the sewers located as proposed by the chief engineer of the Rapid Transit Commission they would be inaccessible. This stand necessitated stopping the work with a consequent delay which will probably occur again from time to time and as the city fathers see fit.

Work on the much-needed rapid transit system for this city will meet with sufficient delay in the ordinary course of construction, through unlooked for rock or quicksand, without unnecessary outside interference from the authorities in power.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

TELEPHONE men are on the *qui vive* for a decision on the Berliner telephone transmitter patent. The final arguments in the case were made over a year ago.

AMONG the many striking features in American export trade during the past three years, none is perhaps more pronounced than the record achieved by the manufacturers of electrical machinery and kindred lines. According to a table prepared by the Treasury Department the exports of electrical machinery increased from a value of $1,652,656 during the first nine months of 1898 to $2,090,787 during the same period of 1899, and to the enormous value of $3,987,405 during the nine months of the current year. The value of the exports of instruments and apparatus for scientific purposes, under which classification are included telegraph, telephone and other electric apparatus, shows a corresponding increase, the values for the periods named being $2,312,555, $4,101,014 and $4,849,789 respectively.

MR. JOHN M. ROACH denies that he will resign the presidency of the Union Traction Company of Chicago to accept the presidency of a Brooklyn electric road.

AN electric lighting board system has been brought out in England by means of which an incandescent lamp can be applied at any point with the certainty that it will light up. The "board" has a prepared face of cork and rubber, and below this there are wires, like a warp, embedded in a preparation of asbestos. Each lamp, or each wall plug, has two sharp pins projecting from its base, and when these pins are pressed through the surface of the "board" they make contact with a pair of wires (positive and negative) below and the lamp-lights. On such a "board" letters or words may be made by attaching lamps in the desired position, and the word may be altered as often as desired. The "board" may also be made as a moulding or filleting, and be run round shop windows, or the skirting boards of rooms and offices, or the interiors of show-cases. The arrangement of the lights is then completely under control and can be varied from day to day if desired. It is claimed that with "boards" of this nature short circuits are impossible.

TESTS are being made in Washington, D. C., of storm warning lights to be placed on the new signal towers recently authorized by Congress to be established in the principal harbors of the country. While the maximum of the present carrying capacity is about five or six miles, it is hoped to reach twelve miles at sea with the new oil lamps, and fifteen to eighteen miles with the electric lights in ordinary weather. American makers have protested against the award to foreign manufacturers, and Chief Moore of the Weather Bureau has decided that preference will be given to the American bidders.

AUTOMOBILES are put to a practical use in Webster City, Ia, by the Martin Telephone Company, which has adopted this means of transportation for linemen to go along the line and make investigations and repairs. It will save railroad fares and be far more convenient for the work.

ACCORDING to news received from London, Eng., the Postal Departmental Commission, which has been inquiring into the subject of wireless telegraphy will shortly report, after some months of deliberation, in favor of the earliest possible adoption of Marconi's system of wireless telegraphy by the postal authorities. The commission is also arranging as to terms for the acquisition of the Marconi patents, and negotiating with France and Germany regarding their attitude towards Marconi's invention.

THE car sheds and electric plant of the Norfolk Railway & Light Company in Huntersville, a suburb of Norfolk, Va., were totally destroyed by fire November 11. Fifty-two cars and the electrical machinery were demolished. The loss is estimated at $150,000, covered by insurance.

A NEW ORLEANS electrician says he has invented a phonograph without a cylinder or diaphragm, a phonograph that simply strings its records on a piano wire, as you might file so many written sheets of paper. When you talk over a telephone the vibrations of your voice send out a series of delicate electric waves. In the new machine a telephone is connected with an electro-magnet, which is excited by the little waves as they travel through it in infinitely rapid succession, and at the same time a long piece of piano wire is drawn past its two poles, very near, but not touching. This magnetizes the wire, but as the magnet itself is continually varying in power, owing to the vibrations, there is a corresponding variation in the effect it produces. That is, the wire is magnetized in different degrees all along its length, as if it were divided into millions of

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very thin disks, each of a separate magnetic power. These disks are the record. For reproduction a mild electric current is sent through the magnet, and the same wire is again passed in front of the poles. The irregularly magnetized wire breaks the current into exactly the same kind of waves that were originally sent out from the telephone, and when an ordinary receiver is connected with it you hear a reproduction of the voice, just as you now hear it over the telephone.

WIRELESS telegraphic apparatus is now actually being erected at La Panne, Belgium, and on one of the Dover-Ostend mail boats, in order that communication between the ship and the shore may be continuously maintained.

THE British cadet-ship Conway has been fitted with new fire-extinguishing apparatus. A tank holding 4,000 gallons is fixed about 7 feet above the deck, but in addition, should a more powerful jet of water be required, pumps have been provided which can be driven either by electricity or steam. The motor is supplied from a storage battery charged by the ship dynamos, and the capacity of the cells suffices to work the pumps seven or eight hours at full speed, the battery already on the ship having been increased in size for this purpose. To deal with the increase of load a second dynamo has been added to the electric lighting plant.

OUR London correspondent writes that Sheerness and Shoeburyness garrisons are now equipped with wireless telegraphy apparatus for transmitting messages across the Estuary. This has been done for the purpose of increasing the efficiency of the arrangements for defending the entrances to the rivers Thames and Medway.

WHAT promises to be the first electricity station in the Congo district is soon to be started at the Roman Catholic Mission of Luluabourg, which is situated on the River Lubia, a tributary of the Kaosas River, which is itself a tributary of the Congo, says the London "Electrical Engineer." The head of the mission, who has for several years been in Luluabourg, is now proceeding there again, taking with him a dynamo, turbine, lamps, cables, wires, etc. He proposes to obtain the necessary power from a waterfall, the fall being some 28 feet high. The dynamo will light 150 lamps, and it is proposed to install 100 incandescent lamps and three arc lamps. The dynamo was manufactured by a firm in Charleroi, and the turbine is of French construction.

A NOVELTY in messenger call-boxes is about to be introduced in New York city. The new boxes, which will take the place of the familiar messenger calls, will each carry a telephone. In design they are circular, about eight inches in diameter, and carrying on one side a small lever, which is used when it is desired simply to call a messenger. On the other side is a hook from which hangs a telephone receiver, the transmitter being on the front of the case. There are no call bells, and, as at present arranged, the district messenger office cannot call up the house in which the box is installed. To call the district office the subscriber has only to remove the telephone from the hook when he can give his message, call the Police of Fire Department, send a boy on any desired errand, or, in short, hold any desired communication with the district office. The interior construction of the new boxes is very simple. They contain the usual train of clockwork and toothed disk running under a contact-making spring found in the ordinary messenger call, and, in addition, a small induction call for the telephone. There is no battery required on the subscriber's premises, the telephones working on the common battery system, in which the batteries are grouped at the district offices. The instruments are connected in series with one another on loop circuits running out from the district offices. So far no arrangement for interconnecting subscribers has been made, but, of course, the system may develop in the future. It is to be introduced in New York immediately. There are now 30,000 call-boxes and eighty-five district offices in the city.

MR. THOMAS A. EDISON has just perfected a new device for heating compressed air which, he asserts, at the same time utilizes all the store energy of coal and obtains fully 95 per cent. of it. "My invention," he says, "is a device for heating compressed air so that the losses in compression and utilizing as power are not only made up, but that it is possible to get power through air compression for less coal per horse power than through the steam engine.

A GERMAN contemporary describes a new type of storage battery switch which is designed to avoid the necessity of employing a booster to furnish the extra voltage for charging when the charging dynamo is required to provide current at the normal voltage for other purposes at the same time. The new switch effects this end by enabling two-thirds of the total number of cells contained in the battery to be always charged together.

AN interesting arrangement is being perfected at Ensley, Ala., for the operation of the two new batteries of coke ovens at Slopes Nos. 4 and 5 by means of electricity. The application will be made to the handling of coal larries, etc., for the purpose of putting the coal in the ovens and the power is expected to be furnished by the steel plant dynamos. When this is successfully accomplished the Ensley vicinity will be probably the only one in the South where such an arrangement is worked in the operation of coke ovens.

AN excellent method for examing the teeth is an electric dental lamp, which consists of a dry battery, connected with which is a small incandescent electric light that can be thrust in the mouth and illuminate the interior.

THE generating of electricity by means of wind power is receiving considerable attention in Germany and in a recent issue of the "Elektrotechnische Zeitschrift" it is stated that Mr. Gustave Couz, of the "Gustave Couz Elektricitäts Gesellschaft," in Hamburg, has been experimenting in this direction with promising results. A wind motor has been erected at the works of the company in question, which has a diameter of 40 feet and an effective sail surface of 1,070 square feet. The motor works at the rate of about 11 revolutions per minute, which speed is regulated by the automatic modification of the direction of the sails to the wind. With this motor an output of 1 hp. to 30 hp. and more may be obtained, according to the force of the wind, which power is transmitted to a 30 hp. shunt-wound iron-clad dynamo, designed to give 120 amperes at 160 volts terminal pressure when running at 700 revolutions per minute. The current generated by this machine is conducted to a switchboard and thence to storage batteries having a capacity of 66,000 watt-hours, or may be delivered to electro motors.

IT was announced last week that the directors of the Manhattan Railway Company of this city have adopted plans for the structure in which will be placed the machinery for the generation of electricity for the various lines of the system. All the large and more important contracts have been awarded, many have been completed and, while no official statement has been made, it is said that the entire Manhattan road will be operated with electric motive power by May of the coming year.

ADOLPH CRONE, a representative of the Prussian Government, and Carl Kratz, of Berlin, arrived in Pittsburg last week. They went there to inspect local manufacturing plants, and possibly to place contracts for machinery. Mr. Kratz represents some of the largest manufacturing interests of Dusseldorf, Germany, and he wishes to secure some of the advanced type of machinery, especially that operated by electricity. While in Cincinnati Mr. Kratz awarded contracts for $200,000 worth of machinery. Mr. Crone's mission is to visit the various industries in all of the large cities and make a report on the same to the German Government.

AN interesting experiment in conducting a Western ranch will be made this winter. It will be tried in Lower California and Mexico by Michigan people. Many of the old ranching methods will be done away with and in their place strictly novel and up-to-date ideas will be put in operation. The ranch is controlled by J. Dudley Morton of Pontiac and his uncle, T. Morris Flower, who has been ranching in Lower California for several years. The ranch will be supplied with all the conveniences possible. A unique feature of it will be the placing of several searchlights on the mountains overlooking the ranch, thus replacing the old system of night riding to prevent thieving. The tender of each light will be armed with a long range rifle and will also be provided with a signal code by which he can flash information to the other light tenders and any one who may be out among the cattle. Each light tender will also have at hand a telephone connected with the main ranch, the pushing of the button ringing an alarm bell. All parts of the ranch will be provided with telephone stations and an electric light plant will be installed at the ranch, all of the buildings being illuminated with electricity.

WHILE the electric arc is the most economical method of producing artificial illumination known, the violet-blue color of its light has always been considered objectionable. According to "Engineering," a German firm has attempted to alter the color, making it more yellow, like sunshine, by impregnating one of the carbons with salts of calcium, silicon and magnesia. As much as 50 per cent. of these salts imparts to the arc light the characteristic reddish yellow flame of the sodium. This combination carbon, only the upper one being of this composition, consumes more rapidly than the pure carbon rod, but this is overcome by making it of larger dimensions, so that even at the increased rate of consumption it will last just as long. Tests of the candle-power produced by such carbons show a remarkable efficiency.

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'Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 1.

ELECTRICITY AND MAGNETISM.

A great majority of the young men in the electrical work to-day have got into it by accident, or in other words, were victims of conditions more than by choice of calling. The electricians who have chosen their line of work and have had the resources to prepare themselves for it by an engineering education constitute a small proportion of the electrical world.

The "accidental electricians" have encountered their ambition to succeed in the electrical world after they have become identified with the work and it is then they find the need of a technical education combined with their practical experience. It is to this class of electrical workers that these series of educational articles will be especially directed and in this way we hope to place the practical worker on an even footing with the engineer who has a technical course at his disposal.

I do not think it is necessary for us to go back to the early discoveries in electricity, when Dr. Gilbert found that not only amber but various other things had a peculiar attractive power when influenced by friction, and follow the course of its development through the various stages up to the present day. All this of course would be interesting reading, but we will leave it to the historian and take up our study of the science as we find it to-day. Electricity has become a part of our lives; we buy and sell it, use it for our convenience in a thousand different ways, and without discussing it theoretically it is best defined as a form of energy. By the word energy is understood the power of doing work, no matter by what means the work may be done. Knowing the fact that it is an energy, now picture in your imagination a substitute for this force which we cannot explain and for convenience sake in studying we will use this substitute of your imagination and call it electricity. You understand whereas electricity has an existence as real as the world around us, it cannot be touched by the organs of sense, consequently we use your mental picture until we delve far enough into the science to replace it with a better explanation.

Electricity is produced in a great number of ways but they all may be classified into some one of the following four classes:

First—By chemical action.
Second—By friction.
Third—By magnetic induction.
Fourth.—By direct application of heat.

BY CHEMICAL ACTION.

A good example of this means of producing the electric current is the ordinary battery. Towards the close of the last century, Volta and Galvani discovered that a current could be produced by chemical means. They found that when zinc and copper were immersed in acidulated water an electric current could be obtained in a conductor by connecting it to the two metals. This principle is what is now known as a primary battery and the current produced in this way is often called Galvanic electricity. There are a great number of different types of batteries used for producing current in this manner and an article will be devoted in the future entirely to them.

BY FRICTION.

The electric current is produced by expending energy in friction. The early discoverers in the science found that by rubbing amber it was made to attract light bodies. This was very mystifying to them and it is interesting to read the great number of theories advanced at the time to explain the phenomenon. This was among the first experiments of producing electricity by friction. A good example of this means to-day is the "glass wheel" frictional machine often used in colleges and laboratories, which apparatus is familiar to all. Another example, and one which is very familiar, is sometimes demonstrated by a swiftly running belt. You have probably often placed your finger close to a belt and noticed the blue sparks jumping across the space.

The frictional method, however, can probably never be of much service for practical purposes as the amount of current produced is so small, although the strength or intensity is great.

MAGNETIC INDUCTION.

This method is the one most generally used and is the basis of the modern dynamo. The principle is that any electrical conductor placed in motion within the influence of a magnet will have induced into it a current of electricity.

BY HEAT.

The possibilities of producing electricity by the direct application of heat has been demonstrated. To produce current in this way the ends of two strips of different metals are connected or soldered together and heated where they join; when their free ends are connected by a wire an electric current will continue to pass through the wire as long as the heat is maintained. Bismuth and antimony give the best results, but owing to their cost iron and german-silver are more commonly employed. As yet no thermal combination has been devised by which current can be satisfactorily produced for electric light or power. This principle, however, has the attention of some of the most eminent scientists of to-day.

MAGNETISM.

We cannot separate the study of magnetism from electricity, neither can we separate the associations which they bear to each other, for from either one we can produce the other in fact; where one exists the other does, or else the influence is there which is productive of it.

By magnetism you can produce electricity. By electricity you can produce magnetism. Magnetism has an existence as real as electricity and like it is not discernible by the organs of sense. You know while it is not perceptible by the organs of sense it exists; we see its effects, know how to produce it, use its influence in hundreds of different ways, and we call it magnetism, yet we cannot study a name for the thing itself, so consequently again resort to our imagination to supply a substitute as we did in electricity and use this for the purpose of studying it.

Magnetism is a condition produced by the influence of electricity. It is separated into two classes, or at least magnets are. Permanent magnets and electro magnets.

An object being magnetized and retaining that condition after the influence is removed which produces it, is called a permanent magnet. A good example of this is the ordinary horseshoe magnet. The various uses of this condition of magnetism we will encounter further on in our series.

An object which does not retain its state of magnetism after having been removed from the condition producing it is called an electromagnet. A greater intensity of condition can be secured in this style of magnets.

The quality of magnetism is that it will attract and hold fast anything which is made of iron or steel but has no effect on zinc, brass, copper, silver or gold, yet there is no visible change in the object magnetized. This earth has a north and south magnetic pole, so has every particle of matter if separated from its companions only in an imperceptible degree; now any magnetized object has the same peculiarities, that is, a north and south pole: one end of your magnetized article will be a north or positive magnetism, and the other end will be south or negative magnetism. These two terms are designated in the science by the sign + for positive and — for negative. Now comes the peculiarity of this wonderful condition. Either ends of your magnet will attract neutral iron or steel, that is, iron or steel not under the influence, but a + end of a magnet will attract the — end of another magnet and will repel the + end of it, so also will the — end of this magnet attract the + end of another while it will repel the — end of it, so we have the following rule to guide us. Like polarities of magnets repel each other while unlike polarities attract.

Permanent magnets are made by using hard steel, which after being magnetized several times will retain its condition.

Electro-magnets are made by using soft iron which will not retain its condition after being removed from the producing condition or after the influence is taken away. The great advantage of this kind of magnet is that a much greater intensity of the condition can be secured, consequently making it much more efficient for electrical purposes and also a great majority of instances where magnets are used are such that this style of magnetism is essential to the operation of the apparatus.

Article No. 2 will be The Laws of Induction.

LONDON NOTES.

(From our London Correspondent)

The Physical Society of London opened its new session on October 26 under the presidency of Dr. Oliver Lodge, F.R.S., who is now principal of the Birmingham University. There was a paper read by Dr. Shelford Bidwell on "Experiments Illustrating Phenomena of Vision" and an interesting discussion followed, Prof. Silvanus P. Thompson, the chairman, Mr. Blakesley and others taking part.

There then followed a paper on "The Concentration at the Electrodes in a Solution, with special reference to the liberation of hydrogen by electrolysis of a mixture of copper sulphate and sulphuric acid." The author was Dr. H. J. S. Sand. Dr. Sand in his paper derived an equation for calculating the concentration at the electrode of a solution of a single salt from which the metal is being deposited under the following conditions: (1) that the solution is contained in a cylindrical vessel bounded by the electrodes; (2) that no convection currents occur; (3) that the diffusion of the salt obeys Fick's law and its transport values are constant. This formula can be made the basis for roughly determining diffusion coefficients.

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NOTES ON THE TESTING OF MODERN DIELECTRICS AT HIGH VOLTAGES *

BY J. WRIGHT.

In these days of electric light and power distribution at increasing voltages, the erstwhile familiar phrase of "— megohms per mile," as specifying the quality of the insulating medium or dielectric surrounding a wire or cable, is being rapidly superseded amongst manufacturers, consulting engineers, and others more or less directly concerned in these matters, by the resistance of that dielectric to disruptive discharge, in terms of the number of volts of E.M.F. to which the cable or wire is subjected before being brought into commercial use.

It is obvious, if we regard this matter in a practical light, that the change is materially for the better, and will benefit both manufacturer and customer, in that it denotes the true value of the dielectric as an insulating medium; a rubber-insulated wire, yielding an insulation resistance of some hundreds of megohms per mile under a testing E.M.F. of 600 volts continuous, may break down immediately under the application of 600 volts alternating, whereas a fiber or oil-insulated main, take, for instance, the Brooks semi-solid system of insulation, though yielding under test only a fraction of a megohm per mile, will withstand a pressure of as much as 20,000 volts alternating without perceptible change. Taking these facts into consideration it is obviously impossible to compare the merits of various dielectrics, or even various qualities of the same dielectric, in terms of megohms per mile, while, on the other hand, by subjecting two entirely different samples of insulating material to a high voltage stressing, or, as it is technically known, "straining," test simultaneously, at regular intervals of their respective "lives," it is possible to judge, with some degree of accuracy, their respective merits.

So important has this matter become, that in many cases specifications for cable contracts lay particular stress upon the resistance of the dielectric to disruptive discharge, the general rule being that it shall be subjected to a testing pressure or voltage at least double that at which it is ultimately intended to work for a certain predetermined period, and (here we have an important point) that the megohmic result obtained after this stressing or straining test shall evidence no perceptible deterioration in the insulating qualities of the dielectric.

To meet the increasing popularity of this form of test all the leading cable manufacturers have for some considerable time now provided the requisite plant for the purpose, such plant usually taking the form of an alternator yielding various low voltages over a convenient range, up to, say, 250 volts, which are then transformed by a suitable transformer, or bank of transformers, up to the required voltage, which may be anything from 1 to 20,000 volts alternating.

In order to undergo the test, the cable, if it be a simple rubber-covered core for example, is immersed in a tank of water with its extremities free, for a certain predetermined period, usually some 24 hours. A careful insulation test is taken on it in the usual manner by the direct deflection method, and the secondary (high tension) winding of the transformer is then connected to one extremity of the cable or core, and to the tank, respectively, the latter connection being usually made by means of an earth plate immersed in the water; the remaining end of the cable being left free. The alternator is then gradually speeded up until the voltmeter indicates the required voltage, which is maintained for the requisite period, after which the machine is gradually slowed down. It is better for all purposes to place two voltmeters in circuit, one across the terminals of the alternator, and the other (usually electrostatic) between the extremity of the core under test and earth, in order to indicate the exact voltage to which the cable is being subjected. If the multiplying power of the transformer be known, the one instrument then serves as a check upon the other.

It will be noted a few lines above, that special stress is laid upon the gradual slowing up of the alternator after the completion of the test; careful attention to this detail admits of an ordinary insulation test being made shortly after the stressing test. If, on the other hand, the voltage be suddenly cut off, in either the primary or secondary branch, it leaves a static charge in the core, which, more especially in a cable of high inductive capacity, tends to interfere with the subsequent galvanometer test, and requires the core to be connected directly with earth for a period proportional to that during which the high voltage was maintained, in order to dissipate itself.

In the case of a lead-sheathed or armored cable, the lead sheathing or other metallic covering, of course, takes the place of the water in the tank, thus rendering immersion unnecessary.

One point which has been noted in the stressing or straining of insulated core, especially where the voltage employed approaches that at which the limit of resistance to disruptive discharge is reached, is the apparent accumulation of potential at the points or extremities of the cable, which makes itself evident in the breaking down of the dielectric at the point where it enters or leaves the water, or, if dry, at the point where the lead or other sheathing ends. Various plans have been suggested from time to time to remedy this unfair distribution of potential, and to maintain it uniform at all points of the core. Probably the most likely one to have the desired effect is that of introducing a bank of lamps or other suitable high resistance between the free extremity of the core and earth, the number of lamps or other resistance being proportional to the voltage under application at the time. There would then be a complete circuit for the high voltage, while, at the same time, provided the plant were sufficiently powerful to maintain the potential under these conditions, that difference of potential would still exist uniformly at all points between conductor and earth, and all tendency to accumulation at the extremities would be prevented by the high resistance path to earth. The only drawback to such a plan is the enormous increase of power required, especially in the case of high voltages. High-voltage testing under normal conditions, in the case of cables of average inductive capacity, such as quarter-mile lengths of the ordinary 19 or 37 strands, for instance, requires the initial expenditure of anything up to 10 hp., and that on a blind or condenser circuit, whereas the adoption of a plan of connections, such as the one mooted above, would involve the doubling or even trebling of that output, and this in a factory turning out some hundreds of miles of various types of insulated core in a week, would be a material consideration tending to a general rise in the price of all cables and wires subjected to such tests—a condition of things to be, if possible, avoided.

Another difficulty in the way of successful high voltage testing is the efficient insulation of plant, and this more especially when dealing with voltages of 10,000 and upwards. There is no special design of transformer suited to the exigencies of cable testing, wherefore manufacturers in general have adopted one of the many well-known types of transformer on the market, and secured whatever extra insulation they could by insulating the case, oil-bath immersion, etc., all of which, though tending to the object in view, viz., the maintenance of a high potential, are highly unsatisfactory in that they are unreliable and open to breakdown at unexpected moments. Taking the question of oil-insulated transformers into consideration, it is obviously impossible to build an oil-immersed unit of any useful capacity for this type of work without proceeding to impracticable dimensions, whereas with the ordinary air-insulated types, unless great care be taken in their construction and erection, constant trouble is experienced in their breaking down at various unexpected points.

What is really required is a highly insulated type of transformer having a capacity of from 20 to 30 hp., capable of adjustment over a wide range of potential, either by subdivision or otherwise, which will enable voltages varying from 1 to 20,000 to be obtained at all times with perfect security from breakdown.

In the matter of actual testing there is no hard and fast rule as to the real voltage to be applied to any particular class of cable or wire, the general rule being that quoted above, viz., at least twice the normal working voltage; but conditions, of course, vary. With dielectrics of an impregnated fibrous disposition such as jute, paper, etc., the testing voltage may be in terms of the radial thickness of the insulating medium, always provided that the actual nature of that medium remains unchanged. With rubber-insulated core this rule does not apply, but depends to a large extent upon the quality of the rubber employed.

The old-time practice of "flashing" the live lead on to the end of the core was altogether an unfair and unsuitable test, in that it imposed enormous momentary potentials due to induction and kindred effects upon the core. The present system of steady application for periods varying from ten minutes to an hour, or even more, forms by far a more suitable method and amply guarantees the insulation of the core. To this end it is frequently specified that such tests shall be carried out like the ordinary galvanometer tests in the presence of the consulting engineer or his representative.

*From the "Electrical Review," London.

JAMES D. DEWELL, president of the Connecticut State Board of Trade, has just appointed a committee consisting of T. H. McKenzie, chairman, of Southington, Zalmon Goodsell of Bridgeport, William H. Matthews of Ansonia, Henry C. Rowe of New Haven and Francis Atwater of Meriden to act in accordance with a resolution passed unanimously at the recent annual meeting of the board. This resolution declares that the duties of the State Railroad Commissioners should be enlarged by delegating to them the supervision of the construction and operation of street railroads and railroads operated by electricity. The committee has instructions to favor this resolution at the next session of the Legislature.

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THE PRESENT STATE OF WIRELESS TELEGRAPHY.*

BY PROF. A. BLONDEL AND CAPT. G. FERRIE.

In this paper the name "Wireless Telegraphy" is taken to refer only to the transmission of signals by means of Hertzian waves without the intermediary of conducting wires connecting the communicating stations. The history of wireless telegraphy may be briefly summarized as follows: In 1888 Hertz performed his famous experiments, but the absence of a sensitive detector did not permit him to think of distance signaling. In 1890, however, M. Branly discovered the principle of his "radio-conductor." This was re-named "coherer" in 1893 by Prof. Lodge, who in working with the instrument destroyed its temporary conductivity by a clockwork hammer. M. Popoff, among others confirmed the experiments of Prof. Lodge, and, in particular, made decoherence automatic by putting the coherer in series with cells and a relay which operated a circuit controlling the hammer. Later, Mr. Marconi applied M. Popoff's vertical wire "feeler," improved the apparatus for producing the waves—making the receiving and sending ends symmetrical—and modified for the better the construction of the coherer. Mr. Marconi also enclosed his apparatus in a metal screening-box, and employed numerous non-inductive resistances as shunts on the relay coils, etc., and thus protected his coherer from radiation produced either externally or internally to the screening-box.

The results obtained by various experimenters show the following facts: The distance which can be signaled across depends on the height of the vertical wires used, and is greater on sea than on land. On sea, in 1897, Marconi's instruments in the Italian navy covered 9 miles with vertical wires 70 to 100 feet long. In 1899, again, between Dover and Boulogne, a vertical wire 110 feet high sufficed for 26 miles. In the same year two vessels of the English navy communicated at a distance of 64 miles with wires 160 feet and 180 feet long. In 1900, Mr. Marconi spanned 77 miles with only 140 feet of vertical wire. In France, M. Tissot, using apparatus due to MM. Ducretet and Popoff, signaled over sea to a distance of 35 miles with vertical wires of 90 feet. In Russia, M. Popoff accomplished the same distance with wires of 180 feet. Captive balloons and kites have been employed on land for suspending vertical wires. Thus Dr. Slaby, in 1897, with wires of 910 feet long signaled 12 miles; M. Voisenat, in 1898, accomplished nearly 6 miles with 120 feet; and Mr. Marconi, in 1899, signaled successfully between Salisbury and Bath, 31 miles, using high kites. Lastly, M. Lecarme, in 1899, established communication between Mont Blanc and Chamouni, and found that a free balloon with a wire of 150 feet could communicate with the sending wire (120 feet long) when at a distance of 5 miles, and at a height of about 2,400 feet.

The law connecting height of vertical wire and distance of good signaling has been given by Mr. Marconi, and confirmed by Mr. Gavey, as $H \propto \sqrt{D}$. Moreover, the heights of the sending and receiving wires should be the same and the wires should be parallel. The authors' own experiments confirm these statements fairly well, but point out that the heights may be simultaneously varied within certain limits so long as their sum is kept constant.

Theory of Wireless Telegraphy.—The authors discuss, briefly, the various theories which have been proposed to explain exactly the action of the emitting on the receiving vertical wire. Then, after referring to a former paper by one of them (Blondel), which showed that the vertical wire oscillator is equivalent to a semi-oscillator of the Hertz type, they proceed to offer the theory which seems to them to be best. The electrical oscillations spread up the wire and agitate the ether round the wire. From there the waves spread through the surrounding ether; the lines of electrostatic force being in planes through the wire and abutting normally on the earth, the lines of magnetic force being circles having the wire as axis. These lines of magnetic force are especially abundant near the surface of the earth in consequence of the well-known concentration effect in the propagation of waves along conducting surfaces. But the concentration does not prevent the loss into space, in the form of hemispherical waves, of a large portion of the original energy.

The receiving wire being cut at divers heights by the spreading circles of magnetic force becomes the seat of oscillatory electromotive forces which act on the coherer. The longer the wire the more circles of magnetic force cut it, and the stronger the effect on the coherer. Guided by this theory the authors have tried experiments when the capacity of the oscillator was much increased and the self-inductance much diminished. The apparatus was then, virtually, a plate condenser with a very short vertical wire, and with this arrangement medium results were obtained.

In discussing the apparatus used in the production of the waves the authors remark that little progress has been made, owing to the exclusive attention paid by experimenters to the receiving apparatus. It is known, however, that the induction coils employed should be as powerful as possible, the sizes most used being those giving 10 to 16 inch sparks between points. Of course between balls, with the balls attached to wire and earth, the spark becomes reduced to 1 inch or 2 inches. The kind of interrupter used in the primary of the induction coil seems to matter little in practice. The authors have tried an alternating-current transformer supplying a pressure of 30,000 volts and above, and one of them has had built recently a new unipolar type of transformer giving a pressure of 100,000 volts. But the use of high-voltage transformers is limited by the fact that they are dangerous and absorb a great deal of power. In all cases it is found that the material of the vertical wire is almost without influence on the signals, that complete insulation—say, by ebonite suspension—is very necessary, and that covered wire may, perhaps, be useful, in that convective leakage is prevented by the insulation; but far the most important factor is the height of the vertical wire.

In the receiving apparatus considerable improvement has taken place, especially with regard to the coherer. To explain the action of the coherer, M. Branly supposes that some modification or orientation of the molecules take place through the action of electric force. Dr. Lodge attributes the diminution of resistance to welding between particles in contact. Whatever the intimate cause of the phenomenon of "coherence" it has been shown by one of the authors (May, 1900) that a coherer, in circuit with cells and a galvanometer, coheres when the potential difference at its ends exceeds a certain amount which has been named the "critical voltage." This voltage must not be exceeded by that of the cells plus that due to the self-induction of the relay circuit in the wireless telegraph receiver; and since the "critical voltage" is higher with the more oxidizable metals it is advantageous to employ filings of the less oxidizable metal. To keep the filings in the same state of oxidation it is advisable to exhaust the space between the electrodes. To alter the pressure with which a filing presses its neighbors, M. Tissot uses magnetic filings, and moves to and from the coherer a magnet whose lines of force are parallel to the tube.

It was natural, as in telephony, to attempt to transform the received impulses up to voltages more suitable for detection. Mr. Marconi uses such a transformer and calls it a "jigger." Its secondary is wound in layers containing successively fewer turns, and is included in the the relay-coherer circuit. The authors' experience of the "jigger" is that the small central condenser added by Mr. Marconi as an attempt to realize syntony has no perceptible action in this direction. According to Mr. Marconi, the "jigger" increases the distance of signaling by 30 to 60 per cent.

Among those things to which investigators should pay attention, the authors mention spontaneous decoherers. M. Tommasina has endeavored to replace the hammer decoherer by a magnetic decoherer, but unfortunately the filings of the coherer ultimately become so magnetized that the "critical voltage" is greatly lowered. The same experimenter has stated that good auto-decoherers can be made with certain kinds of microphone carbon powder. MM. Ducretet and Popoff have used steel powder successfully for a similar purpose.

Other detectors have beed tried by Righi, Tuman and others. One of the present authors has used a Geissler tube containing two large electrodes almost in contact, but found it less sensitive than the filings coherer. M. Neuzschwender makes a detector by taking a strip of mirror and dividing the silvering by a slit. If the arrangement be breathed upon so that some moisture is deposited on the slit a current of some magnitude can pass. The incidence of electro-magnetic radiation, however, diminishes very greatly the current passing. With this "anti-coherer" M. Bela Schafer has covered 34 miles, using wires 90 feet in length.

Telephones as detectors have not been very successful. They would undoubtedly be useful if put in series with a cell and a rapid auto-decohering coherer. With the extreme sensibility of the telephone, coherers of very low "critical voltage" could be used.

One of the gravest practical disadvantages of wireless telegraphy arises from the fact that messages dispatched from any station may be read by stations for which the messages are not intended. To overcome this difficulty Dr. Lodge and Dr. Muirhead have developed a syntonic system in which the receiving coils and capacity are tuned to the period of the emitting apparatus. Mr. Marconi has used earth connected wires placed near the vertical wires and parallel to them, in order to attain tuning. M. Blondel proposed, in 1898, a synchronization system in which a telephone with a certain frequency of vibration selects the radiation emitted from a vertical wire charged at the same frequency by means of an interrupter. Lastly, M. Guarini Foresis has, while putting forward some erroneous theories proposed a system of automatic relays of which the results are not yet known.

*Abstract of a paper read at the International Electricity Congress at Paris. From the "Electrician," London.

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ELECTROLYSIS IN TELEPHONY.

BY P. KERR HIGGINS, A.M.I.E.E.

Text books tell us of the vast amount of decomposition, which takes place in the depositing bath; but, this must not be confounded with the electrolytic action between street car rails and lead cables (in the ground), as the actual damage done in the case of the latter is only about 11 per cent. of that which takes place in the bath. In the former the best conditions are established, in the latter, possibly the worst. That this is true has been time and again demonstrated by tests made under almost all conditions. It is to be regretted, that lead exclusively used for cable sheath is so susceptible to electrolysis, but this cannot be helped, and all that can be done is to prevent the action. It is a known fact that decomposition of iron pipes, by electrolytic action, almost entirely ceases after the current has been flowing in the same direction for some time, while in the case of lead, it is practically continuous while the current is flowing. The use of vitrified tile for conduits reduces the damage to the minimum, while exposed cables, or those in iron ducts, receive the maximum amount of damage due to electrolysis. It is very necessary when a lead sheath becomes damaged, even slightly, that a careful diagnosis should be made as to whether the trouble is due to electrolysis proper, chemical action or natural gas. In case of gas, the lead will show a very decided navy blue color, and the indentations will be uniform and not deep. This latter phase is also characteristic of chemical action only,

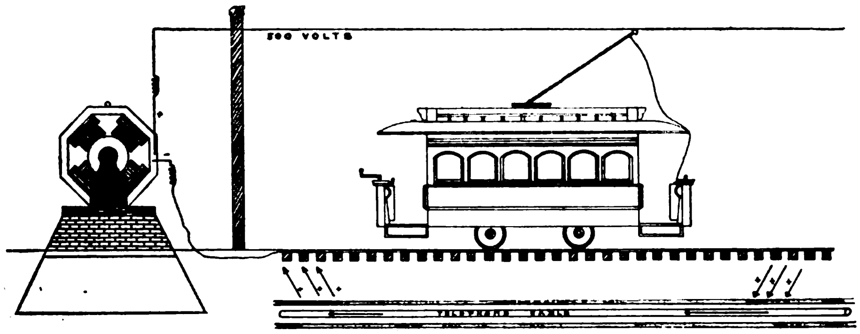

Fig. 1. Condition Before Remedy.

the lead retains its natural color. If due to gas, the leakage should be reported to the gas company, repaired, and ducts well ventilated. If due to chemical action, the lead, where exposed, should be protected, and, if possible the action neutralized, by painting the sheath with asphaltum paint, or applying grease, as the necessity of the case may demand. Should it be due to electrolysis, however, the first thing to do is to understand the cause, then test for the weak spot or spots and apply the remedy. The primary thing to do, in seeking to neutralize electrolysis, is to clear the system of all actual metallic contacts and leave it free, except for leakage; then proceed to drain the system, but this must be done in such a way as not to induce more current from the rails, and can only be done by making the tests as here given, or similar ones. In the installation of underground systems, greater care should be taken by engineers and others in charge of the work, to avoid paralleling the street car tracks, and they should *never* cross under them, as this is where the greatest amount of leakage takes place. In most, if not all cities, the positive (+) pole of the dynamo is connected to the trolley wire, and the negative (—) to the street rails. We have then a positive current passing along the trolley through the car to the rails, the intention being that the current, or the greatest portion of it, will return to the power house by means of these rails and be neutralized; probably it does, but enough, however, escapes through the earth to paralleling conductors, such as water pipes, gas pipes, lead cables, etc., in proportion to the ratio of conductivity which these offer to the path of the current. These afford a ready return back to the station, and it is here the damage is done. This action will

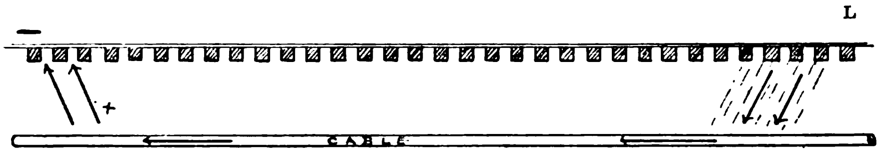

Fig. 2.

be readily seen in Fig. 1, where cables are exposed (or bare) in the ground; there will be found, at or near the points of leakage, fine threads of lead in the earth between the rails and the cable or pipe (L Fig. 2); but, where they are protected with conduits, etc., this is not observed. Occasionally, however, one may find fine particles of lead in the duct when considerable damage has been done. If a voltmeter and ammeter be now connected at this point of leakage (as in Fig. 4) and readings noted, it will be found that a current of high amperage and low voltage is passing from the rails to the cable, probably sufficient to cause damage. To obtain the amount of current which may have leaked into the cable system, take voltmeter and ammeter readings separately and together, and apply the following formula where—

V = voltage with ammeter cut out.
V_2 = " " " " in.
A = ammeter reading, } $V_1 - V_2 : V_1 :: A : X$.
X = required amount. } Formula.

The average EMF. found is about 8 volts, and the amperage from 80 to 100. These tests were

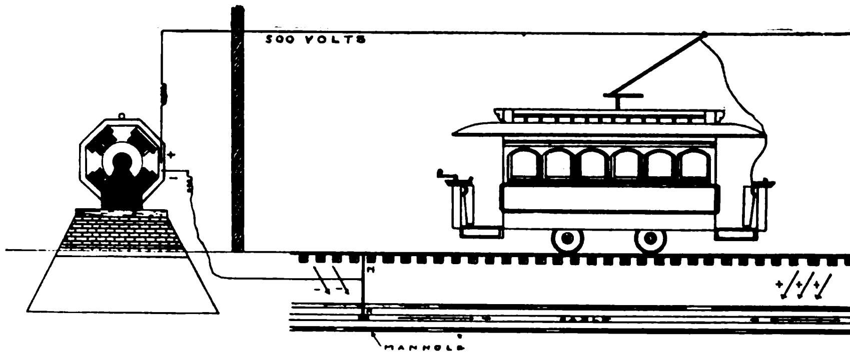

Fig. 3.—Condition After Remedy is Applied.

made when the station load was from 1,550 to 2,100 amperes. The size of the return feeder of the street car system generally runs from 400,000 to 500,000 circular mils, and where the construction is good a large amount really goes back to the power station as originally intended. Lead sheath of cables, such as now used, are supposed to carry safely from 150 to 200 amperes, but it is safer not to carry any at all, and they should at least be in a condition not likely to cause any damage, that is a negative state as opposed to the positive, coming from the rails at point of leakage. Now if we continue our tests (Figs. 4 and 5) along the route back to the power house, we will obtain results which will indicate to us the direction and amount of the current for example, an increasing current will denote that we are still receiving current from the rails, whereas a falling current will show current coming from the power house. By observing this closely we will reach a point where there is absolutely no potential, that is, the point of saturation where there is no tendency for the current to pass from the rails to the cable, or vice versa (see N Fig. 3), this is the point we have been seeking and will be referred to hereafter as the neutral point. We now connect or bond all our cables together, making the entire system one unit; this is done in order to reduce the resistance of the path back to the power house, and also to ensure the protection of points which might have escaped our notice. This bonding (which should be done with 1¼" strip copper tinned) having been completed, we come back to the neutral point at nearest manhole and connect our cable system to the rails at this point. Now, as a rule, this would be sufficient protection if the load on the street car system was uniform throughout, but, inasmuch as it is extremely variable, we are obliged to protect ourselves against all conditions which may arise, and we do this by running a special low resistance return wire of No. 00 or No. 000 insulated copper wire from the neutral point back to the power house (in addition to the connection from cable system to rails), and connect it to the negative bus bar there.

The conditions, after the remedy has been applied, can be readily understood by referring to Fig. 3, where N is the neutral point, and the conditions shown are verified by the tests made with the volt and ammeters. I have in my mind several places where these conditions have been established, and existed for several years, and absolutely no damage has been found during that time, whereas other companies, operating in the same city, but who took no special pains to overcome the damage due to leakage from the rails, have frequently had to take out sections of cable

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almost entirely eaten through. Communities having asphalt streets with cement bottoms under the street car tracks sustain less damage than those not so provided, as these improvements render the ground more or less waterproof, and so protect the cables, etc.; but the ground is frequently made a better conductor by the presence of gas and salts in the earth proper. It is therefore absolutely necessary in making tests, to take into consideration the resistance of the earth under two conditions—moist and dry.

A method of finding the places where the leakage is greatest, which has proved very accurate and useful, is to have a test car (provided with water resistance), go over the route (after all the cars have stopped running), arranging stops to be made at certain intervals of time and have the current shut off at these stated periods, thereby having recording ammeters connected up at the station (as in Fig. 6) R to rail and C to cable a record can thus be had, and a list drawn up from it, showing that the amperage increased or decreased between certain points at a certain time, indicating less or more resistance to ground at these points; in this way the weak points, low resistance along the route may be readily located. We then go over the route, which the test car passed over, and compare the low resistance points on the chart with the route of our cables, and see whether the low resistance is due to close proximity or actual contact of our cables, or is due to foreign contact, such as water or gas pipes, etc. It is well in this connection, to watch carefully all contacts in manholes between gas or water pipes and cables, as also all contact between cables and iron braces, fenders, or manhole covers, as these frequently cause trouble, more especially when these latter are in contact with the street car rails, as is

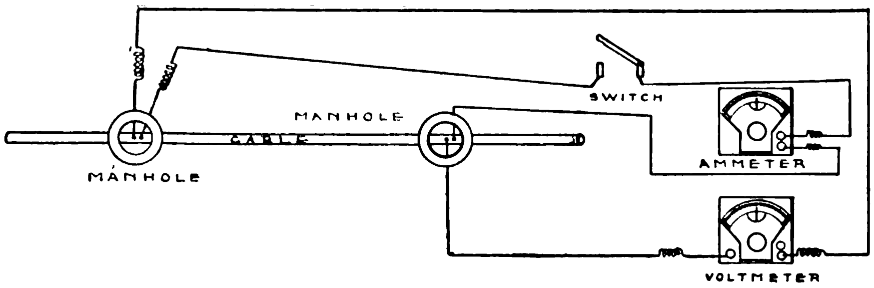

Fig. 4.—Voltmeter and Ammeter Tests can be taken Separately or Together as Desired by This Method.

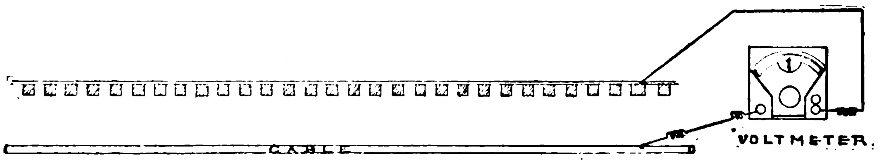

Fig. 5.

frequently the case. It may safely be expected, that if these conditions are established, properly maintained and frequent examinations and tests made, that electrolysis (so far as telephone cables are concerned) will be a thing of the past; but, as already stated, great care must be had in keeping the cables absolutely clear of all foreign metallic contacts, and more especially with the street car rails, except at the neutral point, as only in this way can the remedy be successfully applied. When cables rest on iron hooks, or supports in manholes, they should be protected by placing between them and the supports, sheet lead covered with asphaltum cloth and painted with asphaltum paint; wooden blocks painted also serve well as supports. All manholes should be kept clean, well drained and ventilated to prevent the accumulation of water and gas, which prove injurious to life and limb, and is certainly injurious to the cable sheath, apart from increasing the possibility of leakage. It will be observed, in many cases where tests are made, that a peculiar accumulator effect presents itself, if (for any reason) the power should be suddenly shut off, the ammeter showing a current flowing in the opposite direction to that flowing when current is on. In the case of lead cables this is very marked and registers often as high as 10 to 15 amperes, dissipating itself gradually. This should be watched carefully, as it may cause confusion in making tests. When dealing with the street car people it is well to approach them in a conciliatory manner and not to antagonize them. In this way I have always found them willing to assist me in making tests and connections, but when they are obdurate, and absolutely refuse any concession in the way of tests and contacts at power station and rails, then the only alternative is to go before the council, explain the damage being done and have an ordinance passed, compelling them to grant the privileges desired. I am satisfied, however, that this will seldom be necessary if the companies are approached in the proper manner, as they are generally familiar with the necessity for protection.

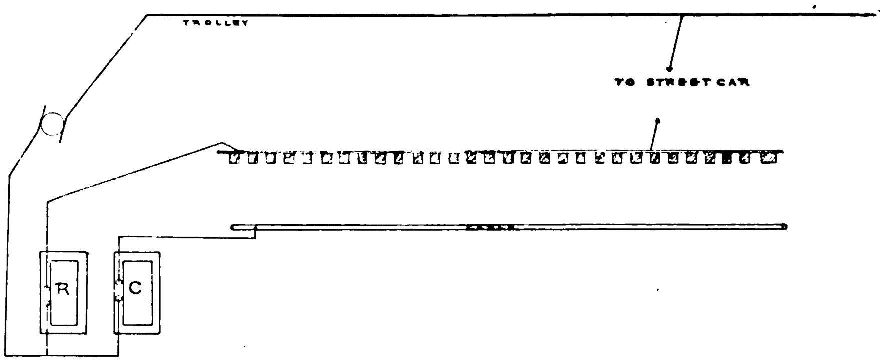

Fig. 6.

Some wrought iron girders in a building in Chicago had to be cut during repairs to make room for a steel column, and it was decided to use electricity instead of the old method of sawing. The girders to be cut were six in number and 14 inches deep with a one-inch web. To accomplish the work it was necessary to melt about 225 holes in the girders, and the actual time spent in cutting all was 3½ hours.

THE NEW POWER HOUSE OF THE BRISTOL TRAMWAYS COMPANY.

[From our London Correspondent.]

Toward the end of the year 1895 the Bristol Tramways & Carriage Company equipped a short section of its lines for electric traction. Much importance attached to the event, because it constituted the opening sentence in the great chapter of electric traction development which has been occurring in England during the past five years. Tramway authorities at that time were unable to recognize what benefit would be certain to follow the conversion, and hence the experiment, as it was then considered, was watched closely to see what was going to happen. The advantages which actually resulted on the electrical section were far and away beyond even those which the company's engineers themselves anticipated. It was not long ere opposition to the trolley gave place to a great demand for its extension, and several new sections have since been brought into service. Municipal fads and fancies hindered the company very considerably in the carrying out of its wishes to adopt the trolley system for the entire tramway service, and it is only at the end of the year 1900 that this has been accomplished. In the course of a week or two now the large power station at St. Philip's Bridge, on the River Avon, will commence the supply of energy to the lines (about 50 miles) upon which somewhere about 250 cars will operate. Some notes of its equipment, which has been carried out on up-to-date lines, will be timely.

The works' site is of course arranged advantageously in the matter of coal and water supply. The engine room is on the ground floor and the boiler room vertically above.

The boiler room contains eight horizontal water tube boilers, each with a capacity of evaporating 8,250 pounds of water per hour, at a steam pressure of 160 pounds. Each is fed by an electrically driven mechanical stoker of the "Coking" type, and the ashes are removed by the return line of the conveyor, and received into a tank outside the building, from which they can be drawn off into barges. The coal supply is received from barges by automatic shovels and delivered into a cold storage tank at the back of the building, from which conveyors of the American noiseless gravity bucket type now becoming usual in large traction power stations (as at Dublin, Shepherd's Bush and Chiswick), deliver the coal into the bunkers above the boilers; from these the supply is drawn off for the furnaces through weighing hoppers. The economizer, which has 360 tubes in 36 sections, is located (together with two 6,000 gallon water tanks) on the floor above the boiler room.

The building itself is steel frame, 140 feet

long, 52 feet wide, and 93 feet in height from the basement to the roof trusses. A 25 ton electrically driven crane traverses the whole length of the engine room. The smoke stack which is at the end of the boiler room has 10 feet clear inside diameter, and is 200 feet above the foundations. It is built up of steel plates in rings lap-jointed and riveted, tapering upwards and finished with an ornamental cap. It is entirely self supporting, lined throughout with fire brick.

The engine house contains vertical cross-compound engines with cylinders 22" and 44" x 43" stroke, running at 90 revolutions per minute; each is direct-coupled to a 500 kw. generator with a 16 feet fly wheel. The steam consumption of the engines is guaranteed to be 12.7 pounds of steam power per I.H.P., with a mechanical efficiency of not less than 92 per cent. The power station is centrally located and energy will be distributed on the continuous current principle. The generators are of the 10-pole type to generate 1,000 amperes at 500 or 550 volts as required. There are also two lighting sets, consisting of two 2-crank tandem compound high-speed engines, running at 400 revolutions per minute, and each having direct-coupled a 50 kw. 500 volt lighting generator. There are also three motor generators each of about 40 kw. capacity for use in connection with the rail return.

The condensing apparatus consists of two surface condensers of the Admiralty type, each containing 3,200 square feet of cooling surface. These are located on the engine room floor. There is a set of vertical twin type air pumps for each condenser. The circulating pump for each condenser is a motor-driven 8" centrifugal pump. This portion of the condensing plant and the auxiliary steam piping are located in the basement. The vertical compound duplex type boiler feed pumps are in the boiler room. The hot well consists of a cylinder 96" long x 48" diameter, and is located in the basement. The water from this hot well is raised to the water tank on the economizer floor by two electrically driven three cylinder pumps.

The switchboard is erected on a raised gallery at the bridge end of the engine room. It consists of white marble panels 8 feet high and 2 inches thick, bolted to angle iron frames. There are four generator panels, two lighting generator panels, three booster panels, 16 feeder panels, one lighting circuit and one meter ditto.

One point of particular interest in connection with this system is that whereas under the Board of Trade Traction Regulations a difference of potential of seven volts is permitted; on the Bristol line the potential difference between the points of the uninsulated return farthest from and nearest to the generating station does not now exceed from 2 to 3 volts. Very special attention has been paid to the bonding of rails so as to avoid electrolysis troubles. The rails are fished together with no less than five plates, one on each side of the web, in the usual manner, and one covering the entire underside, and two strips on the upper side of the bottom flange of the rail-bolted up with 14 bolts. The rails are double bonded at each joint with copper bonds $\frac{7}{16}$th, inch diameter, electrically connected to the web of each rail. There is also a third electric connection formed by Edison's plastic bond, fixed between the rail and the fish plates. Double cross copper bonds each $\frac{7}{16}$th inch diameter are fixed at 120 feet intervals. The bonding is stated to have cost about 7s. per single joint throughout. In addition to these arrangements, negative boosters are also rendering great assistance.

The engineers of the Bristol system are Mr. J. Clifton Robinson (to whom we have to acknowledge our indebtedness for certain of the particulars given in this article), and Mr. H. F. Parshall.

LEARNING TO BE A MANAGER.

Among a given lot of men up for examination there will be found various kinds and degrees of talent. One will be skillful with his hands, as, for example, in mechanical employment or in penmanship: another will be quick at figures; another will be expert as a salesman; still another will succeed in trading. One will have high qualifications as a bookkeeper or accountant, and still others will be faithful to any trust of a subordinate character reposed in them. The one kind of talent, however, that will be hard to obtain, and for which, accordingly, a high market price will be paid, is that of planning and direction, or what is commonly designated as executive ability. It is safe to say that there will be found one hundred persons able to do things under directions to one who is able to plan what to do and set himself or others at the doing of it.

To be able to wind one's self up and set one's self going is a talent in itself, and in the market conception of the case is worth much more than any other phase of individual talent. To be able not only to keep one's self advantageously employed, but to direct the labor of others, is still more valuable. Who is there among men in general more helpless than the individual out of employment, skillful to a degree in certain lines and yet for the time utterly unable to find anything useful to do? The tendency of the times is in the direction of division of labor and specialization. In offices, as in factories, men are trained to certain duties and are held to those duties, to the exclusion of everything else. When, finally, one of this class is thrown out of his regular line and is forced to depend upon his own resources, he is in a sense more helpless than a child. What, then, can be done to overcome this tendency and to render men in general better able to take care of themselves and to become self-reliant and equal to the common emergencies of life?

The fault in many cases is fundamentally that of temperament or habit. The boy looks forward to a certain line of employment as being that which will give him a livelihood, and with the feeling that when he has become skillful in his chosen vocation he will have done all that it is necessary to do. Here some friend ought to correct his planning. Every employment, sooner or later, fails those who are dependent upon it. Conditions change, panics occur, the demand varies. A friendly tip to the young man, therefore, would be, "Learn your trade by all means, but remember that you cannot depend upon it under all conditions. While holding yourself to it as the principal object, do not shut your eyes to other things alongside of it; for example, to adaptations and to variations, an acquaintance with which may be of considerable importance to you, first or last."

But the advice should go further: "Do not for a moment suppose that you have done all that is required of you when you have done one thing, however thoroughly. Do not feel that when you have learned one trade that you have earned the right thereafter to shut your eyes to all responsibilities, save only its requirements, and devote your time to frivolities. Instead, keep on learning, keep on trying, and always have an alternative upon which you can depend in emergencies." It is all summed up in the advice "think and study." While doing one thing learn to do something else by utilizing the time that would otherwise be wasted, for there is more recreation and more real enjoyment in study and planning how to do than in all the frivolities and so-called pleasures of life.

In thus learning how to do more than one thing, the young man will learn in part how to put himself to work. In thus giving attention to something else besides the routine of his daily labor the young man will learn how to adapt himself to varying conditions, and this is one of the first lessons in management or executive work. With an idea in mind of what he would himself do, facing unusual and unexpected conditions, he is, in part at least, prepared to tell others what to do under like conditions, and so, step by step, he gets to the position of a director of work instead of a doer of work. We can by no means exhaust the thought that is in mind in the brief space that can be devoted to such a subject. A volume would be necessary to do it full justice. At least one thought that is contained in these remarks, properly understood, will be of advantage to many of the younger readers of this journal, and that is this: To learn to be a manager, both of self and others, should be the worthy ambition of all.—"Ironmongers' Chronicle," London.

LEGAL NOTE.

In the recent case of Cloverdale vs. Edwards the Supreme Court of Indiana held that where electric light poles and wires were erected in a street under a resolution of the city council, which gave such permission, but expressly reserved "the right to revoke this grant and demand the poles to be removed and remove the same if necessary," the members of the council and the city attorney were not liable in damages for ordering such poles and wires removed after the electric light company's contract to light the street expired, and that, as the owner's business, if destroyed by the order of removal, was destroyed by an order which the council had a right to make, he could not recover damages for its destruction.

SOCIETY NEWS.

The New York Electrical Society.

The 209th meeting of the Society will be held at the College of the City of New York, 23d street and Lexington avenue, on Friday, November 16th, at 8 P. M. Mr. C. P. Steinmetz will lecture on "Alternating Current Engineering." The subject will be treated from the practical standpoint, and the lecture will furnish a complete survey of the tendency of the time in the whole field of electric light, power, and railway work. Mr. Steinmetz occupies a pre-eminent position in this important department of electrical work, and his utterances are received on both sides of the Atlantic with the utmost interest and attention. The lecture will be one of the most important ever delivered before the Society.

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CANADIAN NOTES.

(From our Ottawa Correspondent.)

Mr. W. T. Steward, electrical engineer, says in a communication to the Mayor of Toronto, Ont., that if the Board of Control will postpone the letting of the street lighting contracts for the city for the space of two weeks, that he will engage to "bring in Americans representing several millions of dollars of capital, who will make a proposition to light your streets at a saving of from $40,000 to $45,000 per annum over and above any proposition heretofore made to the city." The city of Vancouver, Mr. Steward states, is saving $12,000 annually in its street lighting bill as the result of having acted upon his proposition, and he exhibits a recommendation from the Mayor of Vancouver corroborating this statement.

The report is current in Toronto, Ont., that negotiations are nearing completion for the amalgamation of the Canada Cycle & Motor Company and the National Cycle & Automobile Company, the two companies recently formed by the amalgamation of several Canadian cycle and motor companies. Such an amalgamation as the one now projected would practically control the whole Canadian cycle business. The report is not denied by officials of the two companies concerned. The Canada Cycle & Motor Company is capitalized at $2,500,000, and the National Cycle & Automobile Company at $2,000,000.

Mr. James Ross, vice-president of the Montreal Electric Street Railway Company, has just returned from a two months' visit to England. Seven years ago Mr. Ross, along with a number of other American and Canadian capitalists, became largely interested in the street railway system in Birmingham, England. For years they have been endeavoring to induce the municipal authorities of Birmingham to allow them to introduce an electric trolley system in that city. It was only a few months ago that this permission was secured, and Mr. Ross states that the first part of new electric line will be opened for traffic about the first of the coming year.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended November 1:

Antwerp, 36 cases, $4,425; 3 cases electric motors, $332; Argentine Republic, 142 cases, $10,110; Australia, 283 cases, $19,526; 12 cases motors, $520; Birkenhead, 19 packages motor trucks, $3,450; Brazil, 13 cases motors and parts, $2,230; 55 packages, $2,309; 16 cases, $2,116; Bremen, 6 cases, $617; 1 box crane trolleys, $300; Bristol, 11 packages $500; British East Indies, 11 packages, $298; British West Indies, 15 cases, $455; Central America, 34 cases, $341; Chili, 44 packages, $1,875; Cuba, 19 packages, $463; Dutch Guiana, 2 cases, $40; Glasgow, 64 cases, $1,554; 10 rolls cable, $2,729; Hamburg, 29 packages, $4,217; Havre, 34 packages, $889; 1 case, $48; Hayti, 2 cases telegraph supplies, $65; Liverpool, 18 cases, $13,318; 43 packages, $5,489; 60 packages trolley poles, $1,511; London, 27 cases, $908; 106 packages; $7,992; Manchester, 1 case motors, $30; 341 packages, $26,500; Mexico, 82 packages, $781; Peru, 24 cases, $624; Santo Domingo, 240 packages, $1,987; Southampton, 8 packages, $178; Uruguay, 1 case, $95; Venezuela, 1 package, $14.

The following are the exports of electrical material and machinery from the port of New York for the week ended November 7:

Antwerp, 7 cases, $1,573, Argentine Republic, 30 cases, $3,648; 260 packages, $4,902; Australia, 23 cases, $660; Brazil, 14 cases, $1,273; British West Indies, 10 packages, $153; Central America, 67 packages, $1,989; Chili, 2 cases, $58; Cuba, 45 cases, $2,797; Ecuador, 1 case, $41; Fiume, 2 cases, $206; Genoa, 326 packages, $31,252; Glasgow, 187 cases, $11,681; 1 case electric instruments, $70; 114 packages, $3,950; Hamburg, 196 cases, $30,964; 30 packages, $2,334; Havre, 10 cases, $825; 145 packages, $3,621; Hayti, 1 case, $36; Leeds 6 packages, $170; Liverpool, 131 packages, $12,996; 1 package trolley material, $18; 2 crates trolley wagons, $337; London, 31 cases, $3,316; 177 packages, $14,247; 1 crate automobiles, $550; 16 boxes motors, $1,536; Mexico, 107 packages, $7,622; Milan, 146 packages, $12,056; Naples, 475 cases, $20,545; Newcastle, 20 cases, $4,000; Peru, 14 packages, $788; Porto Rico, 30 packages, $997; 1 reel wire cable, $124; Southampton, 6 cases, $650; Uruguay, 29 cases, $671; U. S. Colombia, 7 packages, $380; Venezuela, 38 packages, $636; Vienna, 35 cases, $8,151; Zurich, 7 boxes motor parts, $600; 7 cases, $600.

PERSONAL MENTION.

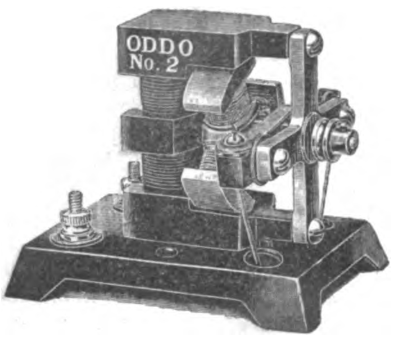
Mr. L. B. Stillwell has been appointed electrical director of the New York Rapid Transit Subway Construction Company. He will have charge of everything pertaining to the electrical equipment and construction of the Rapid Transit Railroad and has already entered upon his duties.

Mr. C. J. Heath, who for the past two years has been the local manager for the Postal Telegraph Company at Pine Bluff, Ark., has been promoted to manager of the company's office at Galveston, Tex.

Mr. Stanley Bartlett of Binghamton, N. Y., has accepted a position with an electrical manufacturing company at Lynn, Mass.

COMMERCIAL PARAGRAPH.

The "Oddo" Junior, the motor shown in the accompanying illustration, which is manufactured by the American Oddity Company, 170 and 172 West Broadway, New York, is according to all accounts, finding a ready sale at the price of



$1. This little piece of electrical mechanism may be used advantageously for many purposes, especially as it will run on one dry cell, making the cost for current almost nil.

INCORPORATIONS.

The West Chester Lighting Company, Port Chester, N. Y.—to manufacture and supply gas and electricity for lighting streets and public and private buildings in villages, towns and cities of the State. Capital stock, $2,500,000. Directors, Charles W. Squires, Charles H. Werner, Richard F. McKintry, Nathan D. Daball, M. J. Warner and Reginald H. Giles, of New York City; Lewis B. Grant, Charles M. Heminway and Henry A. Kentworthy, of Brooklyn.

The North Shore Gas Company, Waukegan, Ill.—to operate gas and electric plants. Capital stock, $1,000,000. Incorporators: W. I. Osborn, E. W. Bentley and M. C. Smith.

The Marietta, Williamstown and Parkersburg Electric Light & Railroad Company, Williamstown, W. Va.—to build and operate electric railway and light plants. Capital stock, $500,000. Incorporators: M. P. Goodman, W. R. Ryan, W. Weil, all of Cleveland, O.; C. M. Mayheir, J. A. Griffin, T. F. Barrett, all of Williamstown.

The Rockingham County Light & Power Company, Portsmouth, N. H.—to do a general electric business. Capital stock, $350,000. Incorporators: W. D. Lovell, Boston, Mass.; A. E. McKeel, R. N. Elwell, both or Exeter; S. W. Emery of Portsmouth and R. D. Hood of Hampton.

The A. E. Hemmel Electric Company, New York City. Capital stock, $3,000 Directors: Andrew Reich, Jr., and J. R. Simpson, New York City; G. Bayard Miller, Brooklyn.

The Grimes Creek Electric Power Company, Camden, N. J.—to supply electricity. Capital stock, $100,000. Incorporators: H. Hoopes, T. G. Janney and W. F. Eidell.

The National Gas Governor Company, San Francisco, Cal.—to deal in gas and electric meters. Capital stock, $100,000. Incorporators: G. R. Kibbe, M. E. Kibbe, H. R. McDougall, all of San Francisco; B. F. Ellis, E. F. Ellis, both of Berkeley.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED NOVEMBER 6, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

661,077. Street-Car Turn-Table. Otto G. Rieske, Dayton, O., assignor, by mesne assignments, to Ernest B. Schneider, Zanesville, O. Filed July 22, 1899.

661,448. Electric Traction of Trains of Vehicles Upon Rails. Lucien Genty, Marseilles, France. Filed May 3, 1900.

661,458. Current-Distributer for Electric Railways. Heinrich Schramm, Nuremberg, Germany, assignor to Otto Herrmann, New York City. Filed May 9, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

661,107. Carbon Pencil or Electrode for Electric Lights. John F. Saunders, Chicago, Ill., assignor to Harry Brown, same place. Filed Sept. 25, 1899.

661,125-661,126. Electric-Arc Lamp. John A. Heany, Philadelphia, Pa., assignor to the Teter-Heany Developing Company, same place and Charleston, W. Va. Filed Feb. 27, 1900.

661,456. Electric Candlestick. Lawrence F. Lewis, New York City, assignor of one-half to Charles G. Till, same place. Filed Jan. 25, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

661,127. Electrical Measuring Instrument. Fredrick A. La Roche, New York City. Filed Aug. 22, 1900.

661,195. Automatic Magnetic Circuit Breaker. William M. Scott, Philadelphia, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed July 22, 1899.

661,196. Rheostat and Circuit Breaker. William M. Scott. Philadelphia, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed Sept. 28, 1899.

661,292. Dynamo-Electric Machine. John F. Kelly, Pittsfield, Mass. Filed May 11, 1900.

661,306. Dynamo-Electric Machine. Cummings C. Chesney, Pittsfield, Mass. Filed May 11, 1900.

661,464. Alternating-Current Motor. Wales Aldrich and Henry E. Borger, Dayton, O., assignors to D. L. Bates & Brother, same place. Filed April 30, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

661,260. Transmitter. Richard H. Ferguson, Baltimore, Md. Filed Aug. 15, 1900.

661,465. Electrical Switch. Nathan Bassett, Philadelphia, Pa., assignor to the Globe Telephone Manufacturing Company, same place. Filed Feb. 8, 1900.

MISCELLANEOUS.

661,085. Process of Making Accumulator-Plates. Zdzislaw Stanecki, Lemberg, Austria-Hungary. Filed Nov. 9, 1899.

661,165. Protecting Underground Metallic Structures from Effects of Electrolysis. Lucien I. Blake, Lawrence, Kans. Filed Aug. 9, 1900.

661,173. Electric Call or Signal Box. George G. Glenn and William S. Sullivan, Philadelphia, Pa. Filed April 20, 1900

661,227. Commutator-Collector. Henry G. Reist and Edward L. Aiken, Schenectady, N Y., assignors to the General Electric Company of New York. Filed June 25, 1898.

661,228. Adjusting Brush-Holders. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 22, 1900.

661,244 Electric Cable. William M. Habirshaw, New York City. Filed Sept. 26, 1900.

661,291. Sparking Igniter for Explosive-Engines. Axel Johnson, Winchester, Mass. Filed Jan. 31, 1900.

661,335. Electromechanical Clutch. Russell E. Cryder, Chicago, Ill., assignor to Charles F. Chapman, same place. Filed March 30, 1900.

661,340. Means for Electrolyzing Liquids. Albert R. Grever, Philadelphia, Pa. Original application filed May 17, 1900. Divided and this application filed July 18, 1900.

661,385. Apparatus for Determining the Position of Foreign Bodies by Means of Roentgen Rays. Charles Remy, Paris, France. Filed Sept. 28, 1899.

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THE TELEPHONE WORLD.

Cheaper 'Phones for Camden, N. J.

The recent controversy over the erection of poles by the Eastern Telephone & Telegraph Company has attracted public attention to this new local competitor of the Bell Telephone service. It has also served to disclose some of the methods by which the Bell interests, which have monopolized the local field ever since telephones were first introduced, are trying to cripple the competitor and prevent competition.

The Bell Company, in its monopoly of the business, had the public absolutely at its mercy for many years, and until the expiration of certain valuable telephone patents had no competitor. The public groaned under exorbitant rates coupled with poor service, but there was no hope of relief until the way was opened for competition.

In Camden, as in Philadelphia and other great centers of trade, complaints against the telephone monopoly have been heard for years, but whenever a competing company tried to enter the field the old company managed, by hook or crook, to keep them out, and thus was able to maintain its high rates and ignore the public demand for a better and cheaper service.

This was not a difficult task because the would-be competitors were mostly speculative concerns managed by men from outside the town, who had no vested interests in Camden, and who were mere franchise-getters. The reverse was the case when the Eastern Telephone & Telegraph Company was formed, within the past six months, for the purpose of filling the long-felt want of a cheaper and better telephone service.

The new company is controlled absolutely by Camden men and is backed by local capital. It has over a hundred stockholders, including some of the leading business men of the town who, appreciating the need of telephone competition, were glad to aid in a practical movement to that end. The men who put their money into the new company have the best interests of Camden at heart, representing as they do financial and business interests that are dependent upon the prosperity of the town.

The new telephone service will be in operation by February 1, 1901.

Some time ago the people of Birchwood, Tenn., and surrounding section decided that they would like to have telephonic communication with the outside world. The East Tennessee Telephone Company had a line extending from Athens over to Decatur in that State, but there was no line running along the bank of the Tennessee River, where it was most needed by farmers to keep in touch with the markets. B. L. Tolley, merchant and farmer of Birchwood, accordingly organized the Tennessee River Telephone Company, which elected Mr. Tolley president. The company decided to build its own line, and made arrangements with the East Tennessee Company to connect with the latter's line both at Chattanooga and at Decatur. The line is now in course of construction and has been finished north to Decatur. T. J. Tolley has the contract to construct the line to Chattanooga. The line runs nearly parallel with the river, and boxes have been placed in farm houses all along the line. Enough money was paid in by the farmers at the start to pay the cost of building the line, and after its completion they expect to maintain it by such small fees and rents as will be collected from those using the line.

At a recent meeting of the Mattoon, Ill., Telephone Company, officers were elected as follows: President, I. A. Lumpkin; vice-president, C. E. Wilson; secretary and manager, John W. Gay; treasurer, W. C. Lumpkin; new members of the board of directors: J. W. Bledsoe and C. E. Wilson. The company has found it necessary to enlarge the switchboard, so as to accommodate 600 instruments.

A novel independent home telephone company has been organized, composed of twelve men, merchants and farmers, to construct a line of twelve miles, from Stearleyville to Bowling Green by way of Poland, Ind., each of whom is to build and equip one mile, each member to put in his own instrument and make his own connections.

The National Telephone Company of Wheeling, W. Va., having acquired a franchise from the county commissioners, will at once proceed to extend its lines out the Pike to Elm Grove and Triadelphia, W. Va., and intermediate points, and later will extend to West Alexander and Little Washington to a connection with a line from Pittsburg.

The Citizens' Telephone Company of Houston, Tex., recently filed an amendment to its charter in the Secretary of State's department, increasing its capital stock from $200,000 to $300,000.

The Telephone, Telegraph & Cable Company has begun work on a new line through White Plains, N. Y.

The Sea Cliff Telephone War.

The New York & New Jersey Telephone Company and the South Side Telephone Company of Long Island are both reaching out after the telephone patronage at Sea Cliff, N. Y., and there is rivalry of the bitterest kind between them. The New York & New Jersey has the prior right, but is at a disadvantage by not having a regularly granted franchise. The South Side has a franchise granted by the village board of trustees, but is experiencing a difficulty in getting a foothold. The older company can not place poles in the village, but it can and does use the poles of the Franklin Electric Illuminating Company, and by so doing goes anywhere it wishes to go. The Franklin Company has recently put in a number of new poles, and the South Side Telephone Company evidently inclines to the belief that the poles are really intended for the use of its rival, while ostensibly belonging to the Franklin people. With this grievance to state, the South Side Company's representative went before a special meeting of the Sea Cliff village board a short time ago. Representatives of the New York & New Jersey Company were also present, and an interesting time ensued. The endeavor to find out to whom the new poles really belonged resulted in a statement conflicting with one recently made before the board, and the question became so complicated in discussion that it was deemed necessary to refer the matter to the corporation counsel for an opinion. The South Side Company's franchise gives the privilege of erecting poles and stringing wires, subject to the approval of the village officials, and will not permit the placing of any pole in front of a piece of property without the consent of the property owner. The Franklin people's franchise apparently permits them to place poles wherever needed, and this gives the New York & New Jersey people a decided advantage, under present conditions. The latter company has for a long term of years had a monopoly of the telephone business in Sea Cliff, and is naturally anxious to do everything possible to keep the rivals out. The South Side Company, however, has received so much encouragement from the officials, the business people and residents generally that they are determined to make the most of their franchise, and get a strong foothold.

General Superintendent James F. Land of the Michigan Telephone Company, announces that there will be practically only one telephone system in Detroit by January 1, 1901. There are now about 1,400 people who use the Detroit telephone system, but when the Michigan Company's new switchboard is in commission, which will be by January 1, users of the Detroit Company's 'phones will not be able to connect with the Michigan Company's 'phones, as the Michigan Company's new switchboard will be one of a battery system, while the Detroit Company's switchboard is of the magnetic system, and the two will not work together.

The Oakland Telephone Company lately placed some of its wires on the poles of the Michigan Company in Pontiac, Mich., with the understanding that it could do so by paying a rental. The Michigan looked at it otherwise and cut the rival company's wires. The town has now given the new company privilege to put up a line of poles of its own.

A Citizens' Telephone Company, solely for convenience and not profit, was organized recently at Adams, Tenn. J. E. Winters was elected president, W. D. Sugg business manager, and Will Edwards secretary and treasurer. The line will extend probably five miles north and south of Adams at present.

The Citizens' Telephone Company of Shelbyville, Tenn., organized a short time ago by the election of John D. Hutton, president; S. J. McCrew, vice-president; R. P. Shapard, secretary, and J. B. Frierson, treasurer. It is understood that the company will begin operations at once.

According to news received from St. Petersburg the telephone systems of the Russian cities, hitherto operated by the State, will be sold at auction on November 20. It is understood that the St Petersburg Municipal Government will bid for the local franchise.

It now seems quite probable that a telephone line between Savannah, Tenn., and Florence, Ala., will be put in in a short time. This will add another important connection with the outside world.

A boycott inaugurated by druggists, grocers, butchers and other retail merchants in Charlotte, N. C., against the Bell Telephone Company has gone into effect. The trouble arose over an increase of rates.

The citizens of Grange, N. H., have petitioned the New England Telephone Company to extend its lines to that place.

A new telephone company has been organized in Lehighton, Pa., to be known as the Lehighton Telephone Company. Messrs. A. P. Herlin, George Coffin and Pearl Prutzman, of Slatington, and A. F. Diefendorfer and others of Lehighton are at the head of it. A charter of incorporation has been applied for and at the next meeting of the council application will be made for the right of way to do business in the borough The new company is to succeed one that is in operation at Slatington and in most of the towns of Monroe County. It is the intention to connect Lehighton with the various towns in Monroe County and Slatington.

The new line of the Inter-State Telephone Company from Raleigh to Wake Forest, N. C., is almost completed. This means another telephone connection with Virginia, for from Henderson there is a branch line to Clarksville, Va., which in turn is connected with all of the important stations in Virginia. Raleigh is now on speaking terms with New York City, by way of Greensboro and Danville, and so on following the railway line to New York. There is also good connection with all of eastern North Carolina, including Wilson, Fayetteville, Dunn, Smithfield, Wilmington and all eastern towns.

The first number of the "American Telephone Journal," a weekly telephone paper will make its appearance on November 15. It is a combination of the "Weekly Telephone Items," published by Frank A. Burrelle, and general telephone news and articles. The present editor and proprietor, W. H. McDonough, who is a thorough business man, will no doubt make of the new enterprise a decided success. The offices of the paper are at 120 Liberty street, N. Y., and the subscription price $3 a year.

The Citizens' Telephone Company has applied for and received a franchise to operate a telephone system in Xenia, O. Marcus Shoup and a number of Chicago capitalists are at the head of the movement and expect to begin work shortly. They will furnish a $1,000 bond for the completion of the line and will give the city six telephones free. The system is an entirely new one, and is much better than the old. The price of telephones will be $1 in residences, $2 in business houses and $3 for both.

The Automatic Telephone Company put its first batch of telephones into commission in New Bedford, Mass., recently, about 100 in number. These are open for business and others will be put in soon. The instruments are being installed at the rate of about 20 per day, and about 600 in all are what the company will start with.

Manager Burk of the local telephone company of Binghamton, N. Y., announced recently that members of the construction company, which will build the plant there, will commence work immediately. Poles have been secured for all of the various routes and all that is awaited now is the wire and other material needed for the system.

The Cumberland Telephone & Telegraph Company has announced new rates to all county towns ranging from 10 to 20 cents, which is greatly appreciated by patrons at Dayton, Tenn.

The telephone system in the New York & Queens County Railway Company's building, Long Island City, was destroyed by fire last week.

The Texas Telephone Company of Brenham lately filed an amendment to its charter increasing its capital stock from $5,000 to $10,000.

Judge B. M. Critchfield, of Sunbury, O., is contemplating the construction of a telephone exchange at Johnstown, Licking County, O.

The Citizens' Telephone Company of Morristown, Tenn., recently purchased the exchange at White Pine, Tenn.

The United States Telephone Company of Cleveland, O., has increased its capital stock to $2,000,000.

TELEPHONE INCORPORATIONS.

The Norwalk & Huron County Telephone Company, Norwalk O. Capital stock, $80,000.

The Amherst Home Telephone Company, North Amherst, O. Capital stock, $25,000.

The Caldwell Independent Telephone Company, Caldwell, O. Capital stock, $5,000. Incorporators: W. H. Bowran, F. M. Martin, John Emmons, Joe H. Ryan and David Friedman.

The Illinois Telephone Construction Company, Chicago, Ill. Capital stock, $2,500. Incorporators: Henry Shafer, S. W. Moon and Frank L. Bills.

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GENERAL ELECTRICAL NEWS.

Lighting.

Alexandria. Va.—The Southern Railroad Company of this city is making arrangements for the erection of an electric plant on its premises for the purpose of lighting the offices, shops and yards.

Bessemer, Ala.—T. T. Huey of this city wants an approximate cost of an electric light plant for a city of 10,000 inhabitants.

Blue Mound, Ill.—This place is making preparations to build a new electric light plant.

Brownsburg, Ind.—Plans are being formulated to build an electric light plant at this place.

Cottage Grove, Ore.—The electric plant owned by A. Nelson was recently destroyed by fire.

Easton, Pa.—The organization of the new electric light company for this town is proceeding. The people who are back of the venture mean business.

Florence, Ala.—The Florence Gas Light & Fuel Company will ask the city council for a franchise for an electric light plant to be operated in connection with its gas plant.

Georgetown Ky.—This city will vote on an issuance of bonds for constructing an electric light plant. A. H. Sinclair, mayor.

Greenport, N. Y.—Public ownership of the electric light and water franchises, which was an experiment in this village prior to May this year, has become thoroughly practical.

Hennessey, Okla.—The citizens of this place are agitating the question of erecting an electric light plant.

Houston, Tex.—The plant of the Citizens' Electric Light & Power Company of this city will shortly undergo considerable improvement. An order was issued by Judge D. E. Bryant authorizing the receiver of the company to purchase $60,000 worth of equipment.

Kingfisher, Okla.—This city has voted the sum of $26,000 for the purpose of putting in an electric light plant, etc.

Larue, O.—It is stated that the Larue Telephone Company will erect an electric light plant in the near future, furnishing a better light to the town than it now possesses.

Leesburg, Va.—J. W. Wright, mayor of this city, will receive bids until November 19 for lighting the streets either by electricity or gasolene for one year beginning January 1, 1901.

Linton, Ind.—An electric light plant will be installed in this city.

Madison, Neb.—The contract for erecting and establishing an electric light plant has been let to the J. J. Bennet Power & Lighting Company of Hastings.

Moline, Ill.—The council is considering the question of erecting an electric light plant at the waterworks.

Mt. Carroll, Ill.—Landlord Beaver of Hotel Glen View is figuring on putting in a water motor and a dynamo and furnishing his own electric lights.

New York City.—Sealed proposals will be received by the committee on buildings of the board of education of this city at the hall of the board, southwest corner of Park avenue and 59th street, November 19 for installing apparatus and an electric lighting plant in a new public school in the Borough of Brooklyn.

Port Jefferson, N. Y.—The question of establishing a lighting district is being agitated and a petition will soon be prepared and presented to the town board asking that body to act in the matter.

Portland, Ore.—Bids for lighting this city will be received at the office of the auditor until November 20. Address T. C. Devlin, clerk.

Rawlins, Wyo.—The Rawlins Electric Light plant will be enlarged and the capacity doubled. The improvement will cost $5,000.

Roachdale, Ind.—A. F. Fields is interested in a company that is being formed here to put in a new electric light plant.

Sardinia, O.—G. A. Kennedy is preparing to erect an electric light plant in this place.

St. Paul, Minn.—The board of public works favor the erection and equipment of a municipal lighting plant for this city.

Sayville, N. Y.—Plans are being formulated for the lighting of the streets of this place with electricity.

Tampa, Fla.—This city will vote upon an issuance of bonds for a municipal electric light plant to be secured either by purchase or construction. Address J. A. Weller, city auditor.

Topeka, Kan.—A resolution was lately adopted by the council instructing the city clerk to advertise for bids for the addition to the city electric light plant.

Weston, Ore.—This place is to have an electric light plant.

Winchester, Tenn.—McDowell & Sons of this city want bids on an electric light plant.

Street Railways.

Ann Arbor, Mich.—Hawkes & Angus, the promoters of the Jackson-Ann Arbor Electric Line are preparing to erect the new line.

Chattanooga, Tenn.—A deal was recently made by which the Rapid Transit Company of this city, backed by Philadelphia capitalists, has obtained possession of the Crass properties on Lookout Mountain, including the incline railroad from St. Elmo to the top of the mountain and the electric lines on the mountain.

Cincinnati, O.—A new electric railroad will be built between this city and Piqua, O., and will be known as the Troy, Tippecanoe & Dayton Interurban Railway. E. H. McKnight, P. Schwab and Col. F. Foster will be the owners of the new road.

Dayton, O.—The Dayton, Springfield & Urbana Electric Railway Company was recently incorporated by F. Colburn, J. G. Webb, J. S. Harshman and W. H. Hanford.

Elwood, Ind.—H. Stillwell is at the head of the new electric railway to connect this city and Indianapolis by way of Tipton.

Ft. Wayne, Ind.—A. N. Dukes of Peru is the promoter of the Towpath Electric Line from this city to Lafayette through Logansport.

Grand Rapids, Mich.—Plans are completed for the building of an interurban electric road from this city to Belding. The road will go by way of Mill Creek and Grattan. G. Stewart Johnson of the Grand Rapids Street Railway Company is one of the parties interested.

Huntsville, Ala.—An electric railway is projected from this city to the Tennessee River. The company that will build the line will be known as the Coatesville & Whitesburg Electric Railway Company.

Ithaca, N. Y.—It is probable that an electric line will be built between Auburn and this city.

Junction City, Kan.—The Junction City Electric Railway, Light & Ice Company has been incorporated with $100,000. The company intends to construct an electric railway from this city to Fort Riley and also operate an electric light plant. The directors are S. W. Pierce, W. W. Cook, J. K. Wright, F. E. Tyler, C. K. Raber and J. Humphrey.

Lima, O.—The Columbus, Lima & Northwestern Railway Company has been organized with $10,000 capital stock for the purpose of operating an electric railroad through Allen, Auglaize, Hardin, Logan, Union, Delaware and other counties. The incorporators are J. C. Brand, E. W. Hamilton and W. E. Sheridan. The principal office is to be in this city.

Meadville, Pa.—It is said that the Meadville Traction Company intends to build an electric line from here to Cambridge Springs, and there connect with the line running to Erie. The distance from Meadville to Erie is 40 miles.

Otsego, N. Y.—This town has granted a franchise to the Oneonta, Cooperstown & Richfield Springs Electric Railroad.

Philadelphia, Pa.—Sir William C. Van Horne is at the head of a company recently formed with a capital of $20,000,000 to develop important railroad and other interests, also to secure control of electric light and trolley franchises in Cuba and to establish plants and systems in every city.

St. Louis, Mo.—The St. Louis, Clayton & St. Charles Railway Company lately petitioned the St. Louis County Court at Clayton for franchises for the construction of three new electric lines in St. Louis County.

Syracuse, N. Y.—The Syracuse & Oneida Lake Electric Railway Company has broken ground for its proposed trolley line between this city and South Bay on Oneida Lake.

Weyauwega, Wis.—W. C. Lawrence and C. C. Pierce of Chicago, A. L. Hutchinson, W. H. Weed and E. H. Jones of this city, are interested in a corporation about to be formed and known as the Wisconsin Midland Railway Company. The present capital stock is $25,000. The object is to build an electric railway line from Berlin to New London via this city and from Poy Sippi to Wautoma via Pine River.

Manufacturing.

Concord, N. H.—A new manufacturing company has located in this city, and is at present actively engaged in the manufacture of an electrical instrument, which is so designed and constructed that it can be attached to one or more generators or dynamos, and will hold the voltage constant at any desired figure from full load to no load taking care of all fluctuations caused by motors and uneven power.

Washington, D. C.—S. D. Newcomb, D. H. Zeigler, D. Messick, C. N. Wine and A. P. Marsh, all of this city, are interested in a recently organized concern known as the Eastern Electric Manufacturing Company, which will manufacture and sell electrical goods on a capital of $1,000,000.

Company Matters.

Hartford, Conn.—The Hartford Electric Light Company has filed in the State Secretary's office a certificate of increase of capital from $700,000 to $1,050,000.

New York City.—The Queens Borough Electric Light & Power Company has lately filed a certificate of increase of capital stock from $250,000 to $410,000.

Norfolk, Va.—The Southern Electrical Equipment Company was recently placed in the hands of a trustee in this city. The liabilities are $7,000.

Sandusky, O.—Business of the Warren Electric Company is very heavy this fall, and the plant is running full time. Mr. C. C. Warren says: "We have orders enough on hand now to more than run us the balance of the winter."

Yarmouth, Me.—All of the machinery, tools and electrical appliances of the Taber & Mayer Company of this place were sold at auction a short time ago to the Yarmouth Manufacturing Company. The plant was established several years ago for the manufacture of telephones for short lines.

Power and Transmission.

Telluride, Col.—On the new plant of the Telluride Power Transmission Company, at Vance, work is going rapidly ahead and the management expects to be ready to furnish power by December 1.

Automobiles.

Chicago, Ill.—The Auto Appliance Company with a capital of $50,000 has been formed here by E. M. Winston, K. J. Green and Ira B. Hutchinson.

Cumberland, Md.—The Maryland Automobile Manufacturing Company of Western Port, whose office is in this city, is negotiating for the purchase or lease of the plant of the Piedmont Foundry and Machine Shops, at Luke, owned by the Twin-Towns Manufacturing Company and operated by Mr. Robert Smith. Mr. Smith is arranging to erect a shop and foundry of his own.

Middletown, Conn.—P. H. Flynn, who is interested in the New York Vehicle Company, which has secured from the trustees of the Worcester Cycle Company two brick factory buildings in this city, recently said: "The buildings were bought for use as an automobile plant, and we will improve the plant. It is expected that between 200 and 300 men will be employed, and that the pay roll will amount to about $60,000 a month."

Newark, N. J.—A branch of the New Jersey Automobile Company has been organized here with its office at 788 Broad street. This concern will do business in Hudson, Essex and Bergen Counties. Arthur H. Hayes, George Paddock and Frederick E. Hodge are among those interested.

Raymond, Cal.—Negotiations are now pending for the supplanting of the present stage line from here into the Yosemite Valley by a line of automobiles.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.–Nov 13.						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1¼ % Q.,	112½	112⅝
Allentown Pa.–Nov 13						
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn–Nov 13:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md–Nov 13:						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.–Nov 13:						
New England Street Ry............	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R..................	100	10,000,000		2¼ % Aug. 99,	155½	157
Brooklyn N. Y.–Nov 13:						
Brooklyn City Ry............	100	2,000,000	1,928,400	....	229	231
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	69¼	69⅝
c Brooklyn Heights Railroad......	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.......	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated.............	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co...........	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad........	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.–Nov 3:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co................	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.–Nov 13						
Columbus Street Railroad...........	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	87	90
Charleston, S. C.–Nov 13						
Charleston City Ry. Co..............	50	100,000	100,000	3 % S.	--	--
Enterprise City RR. Co.............	25	1,000,000	250,000	....	--	--
Chicago, Ill.–Nov 13						
Chicago City Ry. Co................	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	253	260
Chicago & South Side R. T. RR.....	100	10,328,800	10,328,800	....	..	..
Lake Street Elevated RR............	100	10,000,000	10,000,000		9¼	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	32	32½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	75	76¾
North Chicago Street RR............	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR............	100	500,000	249,900	....	190	200
South Chicago City Railway........	100	2,000,000	1,608,200	....	99	.00
West Chicago St. RR. Co............	100	20,000,000	13,189,000	1½ % Q., Feb.	99	100
Union Traction Ry.... ....com.	....	1,250,000	624,900	35 %	12½	13½
Union Traction Co. .... pref.	100	2,000,000	2,000,000	5 % S.	46¼	47
Cincinnati, Ohio.–Nov 13:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry.........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
t Cincinnati Street Ry. Co...........	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.–Nov 13:						
Akron, Bed. & Clev. Elec. Ry.......	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry.....................	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry...............	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.–Nov 13:						
Detroit Citizens' Street Ry..........	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry..........	100	....	1,200,000	....	175	..
Rapid Railway Co....................	....	250,000	250,000	....	90	100
Detroit Electric Railway............	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.–Nov 13:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway....... ..	....	1,100,000	1,100,000	....	114	115

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.–Nov 13						
Hartford Street Ry. Co...............	100	$4,000,000	$200,000	8 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	–
Holyoke Mass.–Nov 13						
Holyoke Street Ry. Co..............	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.–Nov 13						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	
Indianapolis, Ind–Nov 13.						
**Indianapolis Street Ry............	....	5,000,000	5,000,000	....	15	18
Lancaster, Pa.–Nov 13						
Pennsylvania Traction Co..........	100	10,000,000	9,900,000	....	--	–
Lancaster & Col. Electric Ry......	....	....	37,500	....	--	–
West End Street Railway..........	....	....	....	....	--	–
Louisville, Ky.–Nov 13:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	78	79
Louisville Ry... ....pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	109	110
Minneapolis, Minn.–Nov 13						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	....	8,000,000	1,712,200	1¾ %. Oct.	186	187
Montreal, Canada.–Nov 13						
Montreal Street Ry. Co...............	50	4,000,000	4,000,000	8 % S., M. & N.	267	297¾
Toronto Street Ry. Co....	100	6,000,000	6,000,000	1¾ % S., J. & J. †	100¾	101½
Memphis Tenn.–Nov 13:						
Memphis Street Railway Co..........	100	500,000	500,000	....	25	–
New Haven, Conn.–Nov 13:						
Fair Haven & Westville RR.........	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co......	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville..........	100	700,000	800,000	....	..	–
Winchester Avenue RR.............	25	1,000,000	600,000	....	45	46
New Orleans, La.–Nov 13						
Canal & Claiborne RR. Co..........	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR......	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad.....................	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway..........	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York–Nov 13:						
Central Crosstown RR................	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
d Metropolitan Street Ry. Co........	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	168	168⅛
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	32	36
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR.................	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR........ ..guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR............guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR..................	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR....................	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	109	109⅛
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry.	100	2,000,000	2,000,000	....	190	200
Newark N. J.–Nov 13:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	58	59½
North Jersey Railway Co...	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	16	19
Pittsburg, Pa.–Nov 13:						
Allegheny Traction Co..............	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23	23½
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	61⅜	62⅛
p Central Traction Co...............	50	1,500,000	‖900,000	1½ % Nov.	69	70
q Citizens' Traction Co..............	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co............	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co............	50	2,500,000	1,900,000	3½ %, Nov.	½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry...........	50	3,000,000		5 % A., June	..	..
United Traction Co..................com.	50	17,000,000		J. & J.	14	14¼
United Traction Co..................pref	50	8,000,000		J. & J.	51⅜	51¾

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Nov 13						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Nov 13						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Nov 13:						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Nov 13:						
Paterson v. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Nov 13:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Nov 13						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	28	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000 000	29,980,450	....	36⅞	37
*c*Electric Traction Co.	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co.	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry.	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry.	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*c*People's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry.	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
*j*Catherine & Bainbridge St.	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry.	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry.	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Nov 13						
Rochester Railway Co.	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Nov 13						
*j*Reading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry.	50	850,000	850,000	Jan., '98.	188	...
*l*East Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis, Mo.—Nov 3						
Fourth Street & Arsenal Ry.	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry....com.	50	500,000	500,000	....	20	21
United Electric Ry....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	66	67
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Nov 13						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
*m*Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
*m*Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Nov 13:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Nov 13						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Nov 13:						
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Nov 3						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S. §	100¾	102¼
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	260	261
Washington, D. C.—Nov 13						
Belt Ry. Co.	50	500,000	500,000	....	..	..
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co.	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry.	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	29	21
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Nov 13						
*Worcester Traction Co....com.	100	8,000,000	8,000,000	....	81	82½
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Nov 13:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1 %, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866–7–8 p.a. $20,000 in 1899–1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 13						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	153	154
Erie Telegraph & Telephone Co.	100	....	....	1 % Q., Feb. 20,	103	104
New England Telephone Co.	..	10,894,600	10,804,600	$1.50 p. sh. Feb	123⅝	124
New York.—Nov 13						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	....	1¼ % S.	42	50
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	....	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	....	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	....		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	....	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	....	97,370,000	1¼ %, Q, Jan. '99.	85	85¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Nov 13:						
American Dist. Teleg. (Phila.)	25	400,000	....	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	8,960,000	3,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co.	100	....	....	....	60	70
Chicago Telephone Co	100	....	....	....	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	....	....	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	123	125
Providence (R. I.) Teleph. Co.	50	....	....	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	....	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 13						
Fort Wayne Electric trust receipts.	..	....	....	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	....	....	....	36	45
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	--
General Electric Co. [new] "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	149	149⅛
T.-H. Elec. Co..T. Secur., Series C.	..	....	....	....	22	28
Westinghouse Elec. & Mfg.Co.com.	50	....	146,700	....	44	46
Westinghouse El. & M'fg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'fg. Co. assent.	50	11,000,000	8,195,126	....	44¾	45
New York.—Nov 13						
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	....	....	....	8	12
Electric Vehicle Co....com.	..	....	....	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new]... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	149	149⅛
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Nov 13						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.	50	800,000	800,000	Q	--	--
Philadelphia, Pa.—Nov 13						
Edison Electric Light Co.	100	2,000,000	....	....	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	....	....	78	82
*Electric Storage Battery Co...pfd.	100	5,000,000	....	....	78	82
Northern Elec. Light & Power Co.	10	550,000	550,000	....	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Nov 13						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	....	....	47	48
Missouri-Edison (St. Louis)....com.	..	....	....	....	20	21
Eddy Electric Mfg. Co.	25	....	....	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	....	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	....	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	....	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	....	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co.	100	....	....	....	118½	120
Royal Elec. Co. (Montreal)	..	1,000,000	....	2 % Q ‡	198	202
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	133¾	135
Thomson-Houston Welding Co.	100	....	....	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.	100	....	....	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Nov 13:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	....	1,000,000	$3.50 p.sh.	--	100
New York.—Nov 13						
Consolidated Electric Storage Co.	...	....	....	....	8	12
Safety Car Heating & Lighting Co.	100	....	....	....	150	155
Worthington Pump Co....com.	100	5,500,000	5,500,000	....	..	--
Worthington Pump Co....pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Nov 13						
Electro Pneumatic Trans. Co	10	1,500,000	....	--	2⅜	2⅝
United Gas Improvement Co..scrip.	50	10,000,000	....	--	..	162
Welsbach Commercial Co....com.	100	3,500,000	....	--	20½	21½
Welsbach Commercial Co....pfd.	100	500,000	....	2 % Q	73	75
Welsbach Light Co.	5	525,100	....	....	43	44
Welsbach Light Co., Canada.	5	500,000	....	....	1	1½
Pittsburg, Pa.—Nov 13						
Carborundum Mfg. Co.	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Nov 13:						
*Barney & Smith Car Co....com.	100	....	1,000,000	--	13	16
*Barney & Smith Car Co....pfd.	100	....	2,500,000	2 %	94	98
Billings & Spencer Co	25	....	....	....	82	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co	100	....	....	--	105	109
*Pratt & Whitney Co....com.	100	....	....	--	2	4
*Pratt & Whitney Co....pfd	100	....	....	--	40	50
Stillwell-Bierce Co....com.	--	....	....	--	--	58
Stillwell-Bierce Co....pfd.	--	....	....	2 % Sept 1, '99.	50	65
Shultz Belting Co	100	500,000	....	....	88	90
St. Charles Car Co		....	....	....	88	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Nov 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,800	1937	J. & J.	117½	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*128	127½
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	127
Troy City Railway Co....................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Nov 13, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¾
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry......1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR..........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¾
†Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T............ 4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry......1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry......consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	106	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry.........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR............1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids....1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Nov 13 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry....1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	...
The Detroit Ry...................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Nov 13, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5 s	100,000	24,000	1912	M & S	......	....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR..............1st mtg. 6s.	......	50,000	1899	M. & N.	105½	......
Crescent City RR........Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	....
New Orleans City RR..........1st mtg. 6s.	416,500	399,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave..........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co.............1st mtg. 5s.	850,000	850,000	1919	....	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Nov 13, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry.....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry...................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,300,000	1,018,000	1917	F. & A.	......	....
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col tr. 4s.	29,785,000	29,724,876	1945	A. & O.	——	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg. Pa.

Date of Quotation—Nov 13 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co.............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,039,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1919	M. & S.	......	....

Providence R. I.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Nov 13, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J & J	17	

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation—Nov 13, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99⅛	100⅛
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100⅛
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry......1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126⅛	......
†Metropolitan Ry. Co................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126⅛	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105⅛	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Nov 13, 1900						
Belt Ry. Co.......................C... mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.......................... mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Nov 13, 1900.						
Bridgeport Traction Co....... 1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115⅛
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119⅛
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105⅛	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.						
‖$87,000 in treasury.						
§$960,000 res'ved to redeem prior liens.						
††$620,000 in escrow.					*With int'res	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

Boston, Mass.						
Date of Quotation—Nov 13 1900						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation—Nov 13, 1900						
Allegheny County Light Co........ ......6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Nov 13, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	[illegible]	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102⅛	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	....	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Nov 13 1900.					100⅛	101
American Bell Telephone.........................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co...............7s.	....	......	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Nov 13, 1900						
American Electric Heating ....7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co..............	....	....	......	......	.....	25
Barney & Smith Car Co........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	......	....	1904	J & D.	......	......
Worthington Pump Co.........................	75,000	....	......	....	115	127
‖Unlisted †Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The Welsbach Company is said to be earning 6 per cent on its stock.

R. G. Dun, head of the R. G. Dun Mercantile Agency, died on the 10th inst.

The character of buying in Electric Storage Battery common seems to verify the predictions that the price will cross 100 before the end of the present year.

Philadelphia Electric gold 5s, which on Saturday advanced 1¼ points to 101¼, will, it is predicted, soon cross 105; the 4 percent. bonds are in active demand at 69.

The City and Suburban Telegraph Company of Cincinnati recently certified to the Ohio Secretary of State an increase in its capital stock from $2,500,000 to $4,000,000.

A trust mortgage for $1,500,000 has been filed by the Grand Rapids, Holland & Lake Michigan Rapid Railway Company to the American Trust and Savings Company in Detroit, to secure $1,500,000 worth of bonds.

The American Bell Telephone Company reports the output of instruments for the month ended October 20 as follows: gross output, 67,198, increase, 16,337; returned, 30,737, increase 12,693; net output, 36,461, increase, 3,644.

Brooklyn and New York traction securities have been the most active and strongest portions of the New York Stock Exchange list in the bull market which has so suddenly developed. In this movement of the stocks in question there is plenty of evidence that manipulation has had a leading share.

Judge Coxe of the U. S. Circuit Court, New York, in the case of the Electric Vehicle Company and George B. Sheldon vs. Winton Motor Carriage Company upholds the so-called "Sheldon" patents. If the decision is upheld it means that the owner of the patents—the Electric Vehicle Company—has a virtual monopoly to manufacture and use automobiles of the gas and oil type.

There has been renewed interest in Massachusetts Electric Companies' securities by reason of the recent favorable decisions by the Railroad commissioners. The company is fast consolidating its properties. The annual report it is said will make a very favorable showing. Over $1,000,000 has been expended for betterments during the year and the report will show earnings of between 2 and 3 per cent. on the common stock.

The executive committee of the American Telephone and Telegraph Company, consisting of President Alexander Cochrane, Charles W. Amory, and Henry S. Howe, will arrive in St. Louis in a few days to inspect the telephone property in that city. En route to St. Louis the committee will visit several large cities. St. Louis is probably selected as one of the points of inspection from the fact that the largest independent telephone company is in operation there.

At the annual meeting of the stockholders of the Jersey City, Hoboken and Paterson Street Railway Company, held in the offices in Hoboken, the information was given out that the earnings of the combined roads, under the management of President David Young, had greatly exceeded the expenses during the past year. The total earnings of the combined roads, over and above the operating expenses and the amount required to pay interest on the bonds, reached $100,000.

A number of New York. Philadelphia and Canadian capitalists sailed from Philadelphia on the 9th inst. in the interests of the Cuba Company, which was organized some time since with a capital of $20,000,000. Sir William C. Van Horne, chairman of the board of directors of the Canadian Pacific Railroad, was in the party. The purpose of the Company is to secure control of all electric light and trolley franchises in Cuba and to establish plants and systems in every city.

No confirmation can be obtained at the New York office of the General Electric Company of the report that the company was among the bidders on a $25,000,000 contract soon to be awarded by the London, Metropolitan and District Underground Railway Company for the equipment of its system with electricity. It was said, however, that the British Thomson-Houston Company, the European connection of the General Electric Company, might be figuring on the contract.

The plan to build a railroad between Washington and Gettysburg has assumed such shape that George T. Harries, president of the Washington & Gettysburg Railroad Company, says that the preliminaries for its construction have practically been completed. The road will be 72 miles long and will extend from Washington through central and western Maryland. It is understood that the company represents interests which have large holdings in the street railway system of Washington.

Messrs D. Houston & Co., metal brokers, New York, in their monthly market letter say: "The continued large demand for lake copper has been a feature of the situation, which would seem to indicate the manufacture of a great deal of brass even though the Brass Association was dissolved October 1. Consumers are not carrying the customary stocks of ordinary times, and must therefore enter the market for new supplies on a generous scale at no very distant date. With so many producers well sold up for the balance of the year, the quantity of available copper supply is more concentrated and there are no weak holdings apparent anywhere.

The earnings of the Chicago Union Traction Company in the month of October were $45,997 less than earnings in the corresponding month last year. The total for the month was $633,043, which is also less by $7,000 than the earnings in the month of September. These figures do not come directly from officers of the company but are reported authentic. The officers recently decided not to continue publication of the monthly returns of earnings. The decrease in October makes the total decrease for the four months of the present fiscal year since July 1 $50,362. July showed a decrease of $22,000 on top of a still heavier decrease in June, but August and September showed increases in the figures.

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ELECTRICITY.

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ELECTRICITY

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ADVERTISING RATES.

As ELECTRICITY reaches all classes interested in electrical work, its value as an advertising medium can be readily understood. Rates will be sent on application.

Changes of advertisements should reach the office not later than the Saturday preceding the day of publication.

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

The Abuse of the Word Electrical.

Ever since electricity was turned to practical use in the industries enterprising persons with more brains than scruples have made use of the word electricity, or a derivation of it, to further some wildcat scheme and interest, financially, that class of people who are reputed to be born every minute.

Innumerable fakes in the way of electric belts have appeared from time to time in the market. The Rev. Dr. Jernegan, it will be recalled, took a trip to Europe some two years ago with well-filled pockets containing the proceeds of a cleverly gotten up scheme for extracting electrolytically gold from sea-water, but which only succeeded in extracting gold from credulous New Englanders, while now we hear of another enterprise in which again the word electro is brought in, presumably because unsophisticated people are readily made to believe that electricity is omnipotent. We refer to the so-called Electro-Pneumatic Transit Company, which the New York "Herald" has been investigating in the interest of the investing public. After referring to several cleverly worded advertisements, which this company has had inserted in a number of the daily papers regarding the value of its stock, the "Herald" says:

"Stock of an electro-pneumatic company has undoubtedly been quoted on the Wall Street 'curb' for upward of three years. Sometimes it has been sold and sometimes it has been 'washed up,' and at all times there has been a veil of mystery covering the actual or supposititious transactions. It may be added that a veil of mystery also covers the company from its inception to the present day.

"Nearly every company which appeals for public support through Wall Street has a charter, real or fancied officers and offices for the transference of stock, and numerous other things, besides certificates of stock that lead to a belief in its actual existence. The Electro-Pneumatic Company is, of course, similarly situated so far as a revived charter is concerned. Yet so little is known of it that a search recently in the City Directory of 1900, the investors' supplement of the 'Commercial and Financial Chronicle,' the Manual of Statistics of 1900 and the Corporation Directory of 1900 failed utterly to disclose such a company, the names of the officers thereof or any details concerning the organization, amount of capital stock, financial statement or anything else that a company usually provides when it appeals to the public for support.

"Some developments have recently taken place in the Electro-Pneumatic Company, but so far as a diligent investigation has been revealed there has been no actual change in the nature of the enterprise since April 8, 1900, when Cuthbert Mills, a well-known financial writer, published the following in his article in the New York 'Tribune':

"Just about a year ago a single line appeared in this column in respect to a stock in the 'outside market' entitled Electro-Pneumatic, and quoted at 5 or 6. That unfortunate line baited a hook which apparently caught many fish, judging by the letters received when Electro-Pneumatic disappeared from the quotation list. It is now being industriously washed into view again. Its value is the paper it is written on."

Continuing the paper quoted above says:

"Almost the first statement in the advertisement is misleading. It is as follows: 'Electro-Pneumatic Transit stock, now selling under $4 per share, represents intrinsic value which till now has been repressed by reason of circumstances whose removal makes great accomplishments possible.'

"There is no 'intrinsic value' to the stock. It may have a value in the future, but that is contingent, not intrinsic. The 'repression' in value, so termed, is due to the fact that the company lost its charter. In some way it is said to have reclaimed a charter, but whether such reclamation carries with it any rights under the old charter and patents is a matter which will have to be threshed out in the courts.

"What investor wants to buy a participation in a costly law suit? Such is the condition that confronts any purchaser of Electro-Pneumatic stock, for if it has any merit above what Mr. Cuthbert Mills says is 'the paper it is written on' such value is contingent upon the future adjudication of its titles by the courts.

"When men make appeals to the public to buy stock, it is customary to give some details of the proposition. Not one, however, appears in connection with the Electro-Pneumatic Transit advertisement.

"Presuming that it really has an incontestable charter, where are the names of its president, its officers and directors? Where are

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stated the amount of its capital stock and the par value of the shares? Where are its annual report and balance sheet? Where is its plant? What are its patents, held with a free and clear title? And what plant has it installed with the exception of a short strip of tube in Philadelphia, put in by a company, the relations of which to the Electro-Pneumatic Company are now in dispute?

"The advertisement, however, unqualifiedly recommends the purchase of the shares of this company, and by a clever juxtaposition of phrases, mentions it in connection with 'gas company stocks and bonds, gilt-edged issues of New York ferry corporations and the street railway stocks of the country,' and along with the Amalgamated Copper Company, the Standard Oil Company and the New York Air Brake Company, to which it is directly compared.

"References, by the way, to these companies are simply because Electro-Pneumatic is sold on the curb as are other securities mentioned, but no mention is made at the same time of certain other curb securities, Union Copper for instance, or Gold Hill Copper, Bay State Gas, or Electric Brake and Coupler, and there are other securities on the curb which are not as good as Standard Oil and never will be."

It is to be regretted that almost invariably whenever a "wildcat" scheme is thought of the promoters deem it necessary to attach a word to the title that leads people to infer that it is in some way electrical, for by so doing a slur is cast upon other legitimate electrical securities.

* * *

Electric Vehicle Trials in England.

In view of the large amount of interest now being taken in automobiles in this city, due in a great measure to the automobile shows, the following regarding the popularity of electric vehicles in England, and for which we are in part indebted to our London correspondent, should prove interesting.

That the electrically propelled automobile has not made much headway in England is fully demonstrated in the poor number of entries for the competitive trial runs which commenced there on November 6th. The Automobile Club was desirous that electrical vehicles should have every possible encouragement, and it accordingly arranged a series of trials for three consecutive days, at the same time appointing a judges' committee made up as follows: Professor Vernon Boys, Professor C. A. Carus Wilson, Mr. Hugh Harrison, Major H. C. L. Holden, F.R.S., Sir W. H. Preece, Sir David Salomons, Mr. James Swinburne and Mr. Alex. P. Trotter.

The arrangements for the runs were that vehicles should traverse a given course on one charge on Tuesday, November 6th. The following day there was a run of 30 miles, including considerable gradients, and on Thursday 30 miles of average road. The batteries were charged at the Chislehurst Electricity Works each night, and before arriving there they were discharged to 1.8 volts per cell, the owners' representative deciding when they were fully charged. Each day's run was within 50 miles of London, but the exact district was not known to competitors until just before the runs. There were six entries and one had to be withdrawn for unavoidable reasons; there were, therefore, five, as follows:

One Joel car to carry two persons, with Rosenthall battery and Joel motor. Entered by the National Motor Carriage Syndicate of London.

One car, four persons, electro motive power Coy's batteries and two pole motor.

One car ditto, but with four pole enclosed series motor.

One Still Motor Company's car, four persons, "Ideal" battery and Still motor. Entered by the Canadian Electric Motor Company of London.

One car for three or four persons with Leitner battery and Lundell motor. Entered by Electrical Undertakings, Ltd., of London.

The finding of the committee has as yet not been made public.

* * *

The Value of a Trade Paper.

Very few persons connected with the electrical industry, either in the capacity of manufacturer or retailer, can realize what an amount of thought and expense is lavished upon their particular trade paper. They get it week after week, look it over critically for the many interesting items and articles which it contains, many of which they could not possibly get through any other source, carefully scan the advertising pages for any thing which is offered for sale, either new or old, and then lay it away with never a passing thought for the ways and means that allow for this.

To produce a trade paper which does not belie its name means the expenditure of much thought and care; the news must be strictly up-to-date, otherwise it will be useless.

One has only to look at the trade paper of a few years ago and compare it with one of the present day in order to note the strides which have been made toward perfection. Every topic upon which full and reliable information is essential to buyer and seller is treated in detail, and to make it of any value whatever means a careful revision that is entirely foreign to the ordinary run of publications.

Looked at from a mechanical standpoint, the high-class trade paper is a thing of beauty. Being usually of a generous size and printed on fine paper, the highest efforts of the printer's are possible, and its contents are therefore made pleasing alike to the eye and mind, and all this costs money. Several of the American trade journals have, as such, no superiors in the world, either in regard to the scope and value of the information furnished to the branches of the industry they represent, or the commanding position they have attained in class journalism. And it may be safely asserted that no business of any importance could be carried on to-day without an organ devoted to its interests.

There are comparatively few instances where any number of a paper like Electricity fully completes its mission of usefulness. It is read by the head of the house receiving it, perhaps by two or three of his business associates, occasionally by some of the office men, and then is too often filed away or taken possession of by some individual.

The fact of the matter is that the trade paper should have a wider circulation within the personnel of any business than is usually the case. There is hardly an employe in the electrical and kindred industries who would not be of more value to his employer if he were a regular reader of Electricity. If he lacks sufficient interest to subscribe for himself or if he feels unable to do so it would, in most instances, be a profitable investment for his employer to subscribe in his behalf. In any event a copy of the paper should be where the leading employes could find it and they should be invited to avail themselves of that privilege. They should be urged to do so, for within his narrow limitations any salesman or shipping-clerk can secure relatively as much benefit from the columns of a reliable and progressive trade paper as his principals.

Too many salesmen and clerks of proficiency fail to bring the best results to their employers simply because they are confined in too narrow a groove and are not given the opportunity to take that outlook into the world which broadens the mind and quickens the perceptions. Electricity is not designed especially for the employe, but it is to be hoped that there will never be an issue of the paper in which everyone connected with the industries it represents, even though it be in an humble capacity, may not find something to his profit. Even if that something be not directly in line with his particular work it is well for the ambitious, and, therefore, useful employe, to know in what relationship his particular line of work stands to the completed result: what it is that lies outside and yet within reach of him in other departments of the business.

Reading a paper like Electricity should make every salesman, artisan and clerk better fitted for his work, and, therefore, more profitable to his employer.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A press dispatch from Seattle, Wash., November 17, says the Snoqualmie Falls Power Company of that city performed a novel feat in the driving of an electric motor 153 miles distant from the generator. All the transmission lines of the company were connected in one continuous circuit, commencing at Snoqualmie Falls, running to Seattle, back to the falls, then to Tacoma and back again to the falls. The regular transmission is thirty-two miles to Seattle and forty-four miles to Tacoma. The tests were conducted for experimental purposes only and to show that electric transmission of power can be made commercially practicable at much greater distances than has heretofore been contemplated.

At Sault Ste. Marie, Ont., another great center of electro-chemical industry is springing up. A company has been organized, with a capital of $30,000,000, to develop the water power on both the Canadian and United States sides. On the Canadian side, 14,000 horse-power is now being used, while 10,000 horse-power will be taken by the American Alkali Works; other industries, such as nickel reduction works and chemical works, are contemplated.

Consul Listoe, at Rotterdam, in a report to the State Department at Washington, D. C., says that a third telegraphic cable has been laid recently between the Netherlands and England, which will expedite the delivery of American cablegrams via London. One of the wires will be connected immediately with the Atlantic cables at London, thus making it possible to cable to the United States without the intervention of the London office. The cost of the construction of the cable was borne by Great Britain and the Netherlands.

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The Organization Committee of the National Association of Automobile Manufacturers' of America held a meeting last week in the Hoffman House in this city and talked at length over the advisability of making the association similar in aim to that of the League of American Wheelmen and to begin a fight for better roads in this country. The Organization Committee consists of John Brisben Walker, S. T. Davis, Jr., of New York; A. L. Riker of Elizabethport, N. J.; C. J. Field of Brooklyn: J. M. Hill of New York; A. W. Winslow and E. P. Wells of Keene, N. H.

Plans for the proposed electrical workshop and storehouse for equipment to be constructed at the League Island U. S. Navy Yard at Philadelphia, Pa., are now being drawn in the Government engineering department. In the course of a month bids for the new structure will be advertised. This building will be completed in less than a year, and when formally opened will be one of the best equipped and most modern of workshops and storehouses for Government use in this country. The electrical workshop will cost about $84,000.

The Electric Boat Company of Manhattan has contracted with a firm in New Suffolk, N. Y., for a site for a basin to establish a permanent testing plant at that place. The company controls the torpedo boat Holland. A breakwater and basin will be built and half an acre of new land obtained by throwing up back of the breakwater the sand from the bay bottoms. A frame machine shop, 20 by 50 feet, and a larger engine house will be erected. It is stated that next year six boats of nearly the same pattern as the Holland will be built. Experiments will be made in Peconic Bay, N. Y.

An electric time alarm which has been patented lately has at least one novelty to recommend it. It is directly connected to the bed, and it is impossible for the sleeper to stop it until he gets up to stay. Underneath the bed is a series of contact points, the weight of the person forcing them together. A clock is used in connection with the apparatus, and as soon as the hour of rising is indicated the remaining opening or break in the wire is closed, the current passing through the contact points underneath the bed and causing the bell to ring continuously until the sleeper, by leaving the bed, breaks the circuit. Should he lie down again the circuit is again completed and the bell rings until the second rising.

The United States Consul at Magdeburg, Germany, describes an electrical farm operated in Germany in which the power for generating the electric current was derived from a stream whose waters were dammed up to secure the necessary fall to turn a large turbine wheel. Nearly all the farm machinery, including pumps, harvesters, feed cutters, threshing machines, churns and ploughs, were operated by the electricity thus generated, which was conducted to all parts of the farm on overhead wires.

Japan's navy is to have the most powerful wireless telegraph instruments ever made. These instruments, which will be sent from this city to Japan this week, were made specially for the Mikado's Government. There are two of them and they will be installed on two of the fastest Japanese cruisers. It is expected that they will be able to transmit messages at least 125 miles. The machines were constructed for the Marconi system according to Marconi principles and are in the nature of an experiment. It is now probable that the construction of much more powerful instruments will be attempted. The new instruments develop an energy of about 2,000,000 volts, the induction coils contain over one hundred and twenty-five miles of copper wire and weigh 1,500 pounds. A spark or flash 45 inches long has been drawn from them. At that distance the flash has the appearance of an undulating stream of blue fire. When the poles are set nearer together the flashes whiten until at six inches, at which distance the poles will be set when in use, the flashes resemble the flame of an arc-light. When a piece of 4-inch plate-glass was held in the track of the flash it quickly bored a hole through it as clean as an auger would make in a bit of soft wood. For each sending instrument a powerful receiving instrument has been made, which in appearance resembles those used in ordinary telegraphy. In the experiments which it proposes to make with these instruments the Japanese Government expects to accomplish results that have never before been attained with wireless telegraphy.

In the big telegraph suit to be tried at Toronto, Ont., in which the Great Northwestern, the Western Union and the Montreal Telegraph Companies are interested, the Court of Appeal was asked whether the case could not be tried immediately. Opposing counsel objected, stating that the case was one of vast importance and should come before the full court of five judges; that over $90,000,000 are invested in the disputing corporations, and that it would not be fair to the shareholders to proceed at present, as only four judges could be secured to hear the case. The court agreed, directing the case to stand over. The action was brought to attack an agreement by which the Montreal Telegraph Company was absorbed.

The semi-annual meeting of the New York State Electrical Contractors' Association was held at Syracuse, N. Y., last week. The principal business transacted was the consideration of plans for securing favorable legislation during the coming session of the Legislature. The contractors want to have the State license all electricians and a committee was appointed to lay the matter before the Legislature.

A new bottle cleaning machine that works by electricity is said to have been invented recently in Peoria., Ill.

Electric time service was first introduced more than forty years ago. In 1857, in Brussels, Belgium, what was then known as the Nolet system of electric clocks was put in service, about 100 clocks being installed at various places in the city and electrically connected with a master clock at a central point. This system, with many improvements and additions, is still working.

The Bullock Manufacturing Company of Cincinnati, O., has taken one of the largest contracts for electrical machinery that have been let for some time. The contract amounts to $100,000, and is for furnishing a complete electrical equipment for the McCloud River Electric Power Company, Shasta, Cal. The contract calls for four generators of a total capacity of 2,000 kilowatts, and the current will be transmitted 30 miles from the generating plant to the large copper mines just south of Shasta, where the power is needed for the operation of mining machinery. The plant is an unusual one from an engineering point of view, because of the distance that the current will be transmitted. The plant is located in the position that has been selected because of the water advantages, as it will be operated by water power.

In McGill University at Montreal there are thirty fourth-year students in the engineering department. Of this number eighteen, or sixty per cent., are taking the electrical course. The electrical department of the University is now taxed to its utmost capacity, and, notwithstanding the extensive improvements made in it during the past five years, the University authorities are now confronted with the problem of providing still greater accommodation, both as regards space and additional appliances.

The installation of electricity by the Manhattan Elevated Railway of this city is progressing so rapidly that it is now stated that the first train will be operated by the new power on the Second Avenue line between Fifty-ninth and Eighty-ninth street on Thursday of this week. Pending the completion of the Manhattan power-house the Metropolitan Street Railway will supply the electric energy.

The Empire State Power Company's plant at Schoharie Falls, N. Y., is now completed. The plant has cost nearly half a million dollars and is a model in every respect.

The Indianapolis "News" has completed an automobile tour of the northern part of Indiana with the view of investigating the practicability of employing automobiles in the distribution of papers to the towns throughout that State.

Mr. Thomas A. Edison has been granted a patent for a new type of electricity meter. It is said to be a very important invention and belongs particularly to the class in which chemical reactions are called into play.

The Automobile Show in the Grand Central Palace, this city, was opened on the evening of November 14. The attendance was large and persons who took the trouble to go were rewarded by the sight of an unusually large and interesting exhibition of motor vehicles of every description. The fine showing of automobiles is due to the untiring efforts of Mr. Marcus Nathan, who has also arranged for various contests and other attractive features, which will take place before the exhibition closes on November 24.

John L. French of St Louis, is the first man to make a trip from that city to Chicago in an automobile. He completed the distance of 450 miles in 36 hours, notwithstanding he encountered bad roads and frequently followed out-of-the-way directions. He made the journey to prove that the horseless carriage could be used satisfactorily on dirt roads and could be depended on to climb hills and to wheel through deep mud.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 2.

THE LAWS OF INDUCTION.

Electricity will induce or influence magnetism.

One current of electricity will induce or influence another current.

Magnetism will induce or influence electricity.

Magnetism will induce or influence magnetism.

Surrounding a conductor over which a current of electricity is flowing there exists waves of influence circling outward and decreasing in power according to their distance from the conductor. This may be very aptly explained by the conditions noticeable when a pebble is dropped into a still pool of water; if you do this

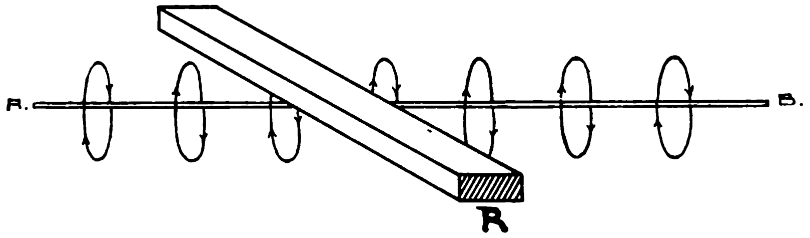

Fig. 1.

you will notice that small circling waves form and travel outward from the point where the pebble strikes. Now in just the same manner the inductive waves of force circle around a conductor through which a current is flowing. Understand and remember that this condition exists along the entire length of the conductor and remains as long as the current is applied. If a small pocket compass is held over the conductor you will find that its needle will point at right angles to the wire, then hold the compass under the wire and you will find that the needle will point in just the opposite direction that it did before, demonstrating that these force waves travel in a different direction above the wire than they do below. This proves that they must travel in a circle around the conductor, which they do, and this experiment also demonstrates that they travel in a direction entirely controlled by the direction in which the current is flowing in the circuit. These waves circle from left to right over the conductor looking in the direction the current is flowing. A good way to remember this is that these lines travel in the same direction as the hands of a watch when you are looking at the dial and the current is flowing in the direction you are looking.

For further experiments let us retain our conductor and assume that there is current continually flowing over it. Suppose we place a bar of iron at right angles across the wire, then this iron will act as a path for the waves and become magnetized. However the magnetism would be very slight and could only be detected by delicate instruments, but the more lines or waves we use this iron as a path for the stronger magnet it will become. To make a magnet then that would be of practical benefit to us we must collect a great number of these inductive waves, form a path through the iron and influence it.

Suppose, in Fig. 1, A B, represents a wire through which an electric current is flowing and the circles indicate the force waves, then the iron, R, only forms a path for the waves directly in its way, and we have the other waves playing no part nor doing nothing toward strengthening the magnetism in the iron. But suppose, as in Fig. 2, we wind the wire around the iron then you find it will form a path for all the lines for they are all bunched in the center of the circle described by the wire. Now let us see. We said these waves existed the full length of our wire, so consequently the more wire we wind around our bar of iron the denser will become the mass of lines for which the iron forms a path and it will become a stronger magnet. The strength and density of the waves depend upon the amount of current passing over the wire and the strength of the magnetism in the iron depends on the number of waves for which it forms a path. We have learned how to make a magnet by taking a piece of iron, winding a coil of wire around it and sending a current of electricity through the wire. The wire must of course be insulated, otherwise the electricity would not follow it but would take a short circuit through the mass of metal and produce no results.

To Produce Electricity by Magnetism.—If you have a wire through which a current is flowing and lay another wire parallel with it the force waves of the first will influence the second and induce a current in it provided the waves are kept in motion. Go back to our example of dropping a pebble into the water. Suppose there be a cork floating in the pool it will of course be set in motion the instant the small waves strike it. If those waves existed but remained stationary they would not influence the cork, but so long as they flow the cork is in motion. So this illustrates our induction of current in a parallel conductor. If the force waves are kept in motion then they will act upon and induce, but if allowed to remain stationary they will have no effect; so by making and breaking the circuit of the first conductor and keeping the waves in motion we induce a current into the other circuit which is parallel to it. When we start the electricity flowing, or complete the circuit, in our first wire the force waves flow from the center and

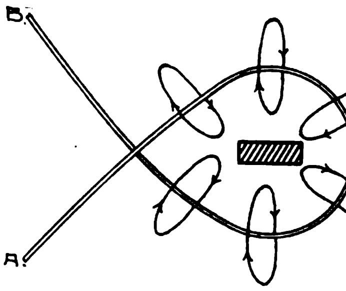

Fig. 2.

travel outward, cutting the parallel wire as they go and induce a current in a certain direction in it. When the circuit is broken these waves then flow from the outside in toward the center and cut the parallel conductor in an opposite direction than they did flowing out, and in so doing induce a current in just the opposite direction to the one first induced. This is the basis of the ordinary induction coil. We can accomplish the same result if we allow our

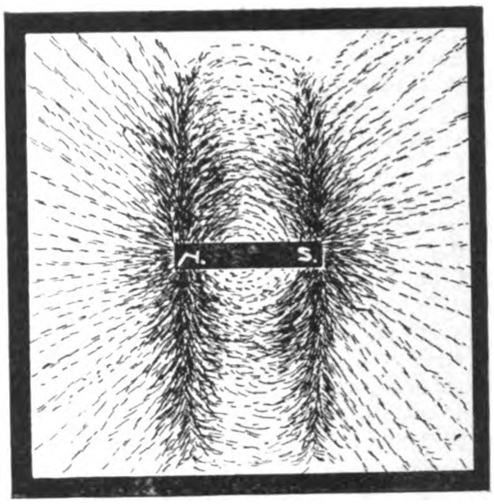

Fig. 3.

waves to remain stationary and draw the wire back and forth through them, for it is practically the same thing. This is the principle of a dynamo.

To accomplish any valuable results in this line we must have a great concentrated mass of these waves and also a large amount of wire. Iron not only becomes magnetized by the lines but it also forms a reservoir for them. If the lines could be seen surrounding a magnet they would describe a mass very much like Fig. 3. You will notice how the lines at N seem to circle toward S and the ones at S to circle toward N, with the greatest density at the two ends. If a coil of wire is put in motion within the influence of these lines of force it will have induced into it a current of electricity. The

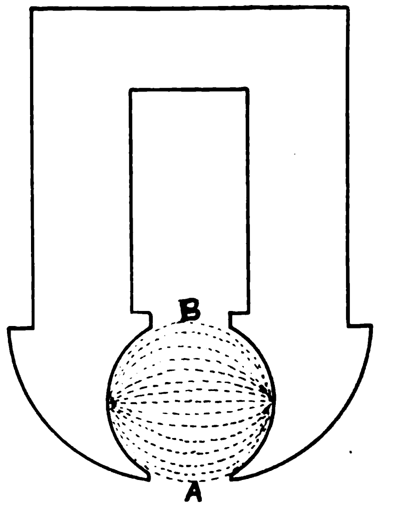

Fig. 4.

stronger the magnet the greater the number of lines and the greater the number of lines the more effect will be produced in the coil of wire.

We have seen how we can produce magnetism by electricity, how a current of electricity in a conductor will induce a current in a parallel conductor, how magnetism will produce electricity, how also magnetism will produce magnetism, for place a piece of iron against a magnet and you will find it will also become magnetized, that is, it will practically become part of the magnet itself, and the neutral point will then be where the two pieces of iron come to-

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gether with the poles of the magnet as before at the extreme ends.

In a magnet the lines of force are strongest and most dense at the ends and radiate from each pole as though they were attracted by the others. This in fact is just what happens and if we use a U-shaped piece of iron for our magnet, bringing the ends closer together, we will have these lines collected into a smaller space and consequently of a much greater density, which is the object we wish to attain when we use it for inducing current into coils of wire. This gives us, as seen in Fig. 4, the shape and principle used in modern dynamos. If a closed loop of wire be passed upward from A to B between the poles the current induced in the wire will flow in the opposite direction to what it would if the loop were passed downward from B to A, demonstrating that the direction of the induced flow of current depends upon the direction the loop is cut by the lines of force.

The waves radiating from a magnet are called lines of force and the space within which they radiate is known as the field of force.

Article No. 3 will be entitled The Electrica Measurements.

THE RELATIVE ADVANTAGES OF NARROW AND STANDARD GAUGES FOR ELECTRIC ROADS.*

BY F. GUNDERLOCH.

This report considers the following question: What are the relative advantages and disadvantages of narrow gauge and standard gauge for electric street railways, especially in regard to the mounting of sufficiently heavy motors and other mechanical appliances?

On account of the greater efficiency of electric motor cars, the strictly city street car lines have been extended into suburban districts, which naturally present new problems for solution. One of these is the demand for higher speed and the accompanying necessity for heavier and stronger cars. The greatly varying traffic further made it necessary, at certain hours, to run trains consisting of a number of cars. The motor cars must possess sufficient weight for traction and be equipped with motors which can furnish the requisite draw-bar pull. In general, care must be taken in projecting an electric road so to build it that it can extend in the future, and new requirements be met without difficulty.

An important role in this connection is played by the choice of the right gauge. As gauges of less than 1 m. are seldom met with, this paper only compares the meter gauge with the standard gauge. Only eleven companies sent replies to the above question, and from these the following general conclusions have been drawn:

1. The narrow gauge permits an easy rounding of sharp curves. With the present types of motor cars, with a wheel base of from 1.6 m. to 2 m., this advantage is not a very important one. It has been found that of sixty-one electric roads having curves of 20 m. radius or less, thirty-three employ the standard gauge, and only twenty-eight the meter gauge. This shows that the occurrence of a few sharp curves should not be sufficient cause to induce railway companies to adopt the narrow gauge.

2. There is less expense connected with the construction and maintenance of a narrow gauge than standard gauge. This, of course, only becomes of importance where the company builds its own roadbed, and where the same is of considerable length. The narrow gauge requires a smaller expenditure for roadways, the transportation of earth and general construction.

3. As the electric roads are feeling more and more the competition with steam roads, especially in the transportation of freight, it is to their advantage to use the standard gauge, as it enables the electric freight cars to traverse the tracks of the steam road, thus saving the cost of unloading, and vice versa. To permit this the following conditions, however, must be observed in the building of the street car line:

(a) There must be no curves of a radius less than 150 m.

(b) The rails must be so supported that they can resist at any point a moving load of 6,000 kg. at a speed of 30 km. per hour.

(c) There must be a clear space above the track of 760 mm.

(d) The track axes must be 4 m. apart.

(e) There must be no grades which would overload the motors for too long a time.

(f) Such brakes must be installed and such a speed must be be chosen on public highways that the train can be brought to a stop within the distance required by law.

It is worthy of note that a number of original narrow-gauge roads, in order to become more serviceable, have changed over entirely to the standard gauge, or have laid a third rail.

4. As the motors are mounted between the wheels of the motor car, it is evident that larger motors can be installed on standard-gauge cars than on those built for narrow gauge. To compensate for this difference it is often necessary to equip narrow-gauge cars with two motors, which entails a considerable expense. It has the advantage, however, that if one motor should break down the other one will still be able to propel the car. Besides a two-axle car more evenly distributes the weight and starts with less jar than a single-axle car. Furthermore, two motors and a series-parallel controller permit of a better regulation of speed. It is also possible to attach a trailer to a motor car equipped with two heavy motors, or even attach a freight car during those hours when passenger traffic is light. To do this same work on a narrow-gauge road, four-axle cars with four motors must be employed, which necessitates a considerable expense. It is also more advantageous to use larger motors running at a slower speed with the armatures mounted directly on the wheel axles and so avoid the use of reducing gears. Such motors can only be used on standard-gauge cars.

5. The use of large motors on narrow-gauge cars takes up all the room between the wheels. Thus the accessibility to the various parts is made more difficult, which is a great disadvantage. The motors are further exposed to a greater extent to the water thrown up from the track during travel, as the space beneath the motors is too small to allow for the provision of proper guards.

6. The small space also forbids the mounting of air pumps for the use of air brakes alongside of the motors, and in any case the arrangement of the brake mechanism is less convenient on narrow gauge than on standard-gauge cars, on account of the crowded condition between the wheels.

7. The standard-gauge cars are also more stable than narrow-gauge cars. In the latter cars with longitudinal seats the wheel boxes become very objectionable.

8. In conclusion, a few remarks should be addressed on this subject to the owners and maintainers of highways who are in the habit of advising the railway companies to build narrow-gauge roads because they take up less room than those of standard gauge. This is an erroneous idea, however, as experience has shown that other vehicles will not use the narrow-gauge tracks, but travel alongside, and thus take up a great deal of valuable space on the roadway. As the narrow-gauge cars have the same width as the standard gauge ones, the space taken up by them is the same. There will, furthermore, be fewer collisions between vehicles and cars on broad-gauge roads, as the former are kept further away from the gauge line.

From the above it will be seen that for electric street railway service the standard gauge possesses many advantages, and is more commonly employed. I should not recommend the change to the narrow gauge, which would exclude the possibility of running street cars over steam railroad tracks.

* Abstract of report read before the International Tramway Congress, Paris, September, 1900.

PROGRESS IN ELECTRIC LAMPS.*

BY PROF. ANDRE BLONDEL.

The object of this paper is to pass in review the improvements realized up to the present, and those still to be hoped for, in arc and incandescent lamps.

Progress in Arc Lamps.—During the past 10 years great strides have been made both as regards the theory and the construction of arc lamps. Our theoretical knowledge of the properties of the arc has greatly increased. The measurements of M. Violle have shown that the maximum temperatures reached in the arc are 3,500° C. at the positive, 2,700° C. at the negative carbon, and also that in a closed space the brightness and the temperature of the crater are constant. Again, after a discussion, joined in by many authorities, it seems now settled in conformity with the present author's conclusions that the back EMF. in the arc exists only as rising from the arc's resistance, which can be considerably modified by the addition of salts to the crater. Mrs. Ayrton's experiments have connected by simple laws various phenomena of the arc; in particular they have shown that the energy consumed is a linear function for each diameter of the carbon. That the apparent resistance varies not only with the diameter of the carbons and the length of the arc, but also with the nature of the carbons and the surrounding gas has been shown by various experimenters. Mr. E. Wilson, repeating an experiment by M. Cailletet, has shown that the brightness of the positive carbon diminishes when the pressure is increased, and that by the withdrawal of gas a carbon mist is produced. M. Le Chatelier has attributed the constancy of the temperature of the crater to the presence of fusing carbon there. In addition, the author's experiments have shown that in free air the brilliancy of the arc increases with the current,

*Abstract of a paper read at the International Congress of Electricity at Paris. From the "Electrician," London.

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and passes from 150 candles per square millimeter for small arcs to 220 candles per square millimeter for powerful arcs. Mrs. Ayrton, in her researches on the hissing of the arc, discovered that the hissing is caused by the advent of oxygen at the crater, and that the phenomenon does not occur below a certain current density, and is preceded by Trotter's phenomenon of the rotation of the arc on itself.

As regards the alternating-current arc the author has given a detailed analysis of its periods of lighting and extinction, and of its current and voltage curves; he has shown the parts played by the resistance and the self-induction of the circuit, the conductivity of the core, and the form of the EMF. curve of the generator.

The electric arc does not conform to Ohm's law, for increase of current produces widening of the arc, and consequently a diminution of the resistance. This leads to instability, which must be guarded against, on a constant-potential supply, by the inclusion of a resistance in series. This instability was studied by the author in 1891 by drawing "characteristic curves of extinction," in which the potential difference between the lamp terminals was plotted for various currents.

As regards the mode of regulation, the differential system seems now universally admitted to be the best. We may take with the minimum voltage of 30 volts for the arc a potential drop of 1.5 volts in the steadying resistance for alternating arcs, and with 33 volts a fall of 3.5 volts to 4 volts in the resistance for continous current arcs. The use of shunt-lamps presents some advantages over the differential system; the lamps are simpler; there is no risk of burning out by too strong a current; and they permit of easier regulation of the current within wide limits.

The oscillographic study of the extinction of the arc without additional resistance, shows it to take place slowly, the phenomenon requiring about $\frac{1}{10}$ second, or even more for its completion. This indicates that with quick-acting and sensitive mechanism the normal arc may be uninterruptedly maintained with only small steadying resistance in series. The inertia of the moving parts leads to hunting however, unless the vibrations set up are rapidly damped by a dash-pot. In the best modern lamps, air dash-pots are employed, and the adjusting mechanism has reached great perfection. Arc lamps have numerous constructional conditions to satisfy. They must be able to stand rough handling and every weather, and must be capable of easy and quick replenishment and repair. It is noticeable that of recent years there has been a tendency to revert to the use of clockwork mechanism on account of its great sensitiveness and small consumption of energy. As for motor mechanisms, they are rather complicated when continuous currents are used, but with alternating currents assume various elegant forms of the type of a metal disk embraced by electro-magnets of suitably differing phases. With certain types of mechanism in alternating current lamps the self-induction of the regulating coils tends to reduce the sensitiveness. This self-induction effect might be compensated, as M. Claude has suggested, by proper condensers. The self-induction, however, tends also to keep the impedance almost constant, in spite of variations of the resistance of the coils through temperature alterations, and so gives the alternating-current lamp some advantage over the continuous-current lamp. In the latter lamps ingenious temperature compensators have been adapted, but these unfortunately leave uncorrected the variations of the resistance produced by the shortening of the carbons. Improvements in mechanisn have brought many good double carbon lamps into use, among these the Crompton-Pochin, Brockie-Pell, and Korting and Mathiesen lamps may be mentioned. The author has for a long time considered that these lamps are very efficient as regards the utilization of the energy supplied. Besides this they require little labor and are economical in carbons.

Modern methods of lamp grouping differ greatly from the old system, in which the employment of isolated lamps was necessary. One modern tendency is, however, to use high-voltage enclosed lamps working directly at 110 volts; another is to use, as of old, two lamps in series, each absorbing from 30 volts to 35 volts. In both these cases the steadying resistance is important. But by the construction of differential lamps the importance of the steadying resistance is minimized. Low-voltage lamps have been in use since 1889, but it was not till after 1897, when the Hegner (Volta) lamp appeared, that the low-voltage lamp entered largely into industrial practice. Siemens & Halske, as also Korting & Mathiesen, in their low-voltage lamps use, at starting, a high resistance which is afterwards gradually removed. With these the fear arises that, in spite of the perfection of the mechanism, certain circumstances may lead to a dangerous increase of the current. Hegner, using also differential lamps, but without special mechanism, puts three in series with an automatic rheostat of four parts, which are removed successively as the lamps get started, thus securing a more stable and less dangerous arrangement than the former. Still more recently Vigreux and Brillé have proposed a special mechanism on the differential system which without springs, weights or frictional appliances, can produce a very rapid recoil of the carbon if the arc becomes shorted. The advantages of these low-voltage lamps are that they enable a better distribution of illumination to be effected, and that they are more economical as regards consumption of energy. Against these advantages must be set, however, the heavy initial expense, the complication and delicacy of the mechanism, and the necessity for carbons of very special quality.

With these lamps, grouping by threes is called for only on short, small resistance circuits. When large areas are being supplied the leads furnish sufficient steadying resistance for the usual arrangement of two arcs in series. In any case it is only on circuits at 110 volts and when sub-division of the illumination is desired, that low-resistance lamps are specially useful. When, however, the distribution is made at 220 volts, and especially when 220 volts is to be substituted for 110 volts in an existing circuit, a reduction of the number of lamps under a given voltage should rather be aimed at. The solution of this problem is afforded by the enclosed arc lamp.

Illumination by arc lamps in series, with both continuous and alternating currents, is still much in vogue in the United States, but has been almost completely abandoned in Europe on account of the lack of independence among the lamps and the dangers accompanying the use of high-pressure currents. A recent application in this direction in England consists in the employment of constant-current transformers and Ferranti rectifiers, and thus allows the use of lamps giving a better light distribution than alternating-current arcs. The pulsating current produced is, however, as dangerous as alternating current. On the Continent commutator transformation to continuous current, or the use of alternating-current lamps with reflectors, is preferred.

The enclosed arc lamp did not assume importance till 1894. It is characterized by having a very long arc using a tension of 75 to 80 volts. In the Marks (or Jandus) lamp the arc is surrounded by a double globe, the inner one of which possesses a valve (check-gas plug), which permits expansion of the contained air. The outer large globe is protective, and becomes filled with gas from the inner globe. In these circumstances the carbons are consumed very slowly, and the arc itself is modified in character—the upper positive carbon is, through rotation of the arc, scarcely hollowed, the lower negative carbon is plane, while their normal distance apart is 8 mm. at 80 volts. The mechanism of all makes of these lamps is of the most rudimentary type. And since the carbon consumption is small the displacement of the luminous spot is very little. The advantages of these lamps are: their independence of one another, the ease of their application in 110 volts or 220 volts systems, the extreme simplicity of their mechanism, the employment of cheap carbons, the small consumption of the carbons, and the reduction in the amount of attention necessary. Their disadvantages are, on the other hand, the blue tint in the light, the variations of brightness which render almost necessary the use of a diffusing globe, the fouling of this by a silicious deposit, and the mediocrity of the light from large carbons. The disadvantages attending the use of alternating-current enclosed lamps remain still so numerous that this type of enclosed lamp cannot yet be regarded as a success.

The manufacture of arc lamp carbons has rereceived, of course, much attention. The old method of baking several times a paste of carbon powder treated with certain syrups is quite discarded; its products were of the highest excellence, but were very expensive. Now, gas carbon, selected carefully and powdered, is mixed with various proportions of lamp-black and tar; and sometimes, with a view to increasing the luminosity or the durability, chemicals are added. The paste, well worked up, is squirted, and finally, cooked at the highest possible temperature. Most European manufacturers give the positive carbon a core of carbon containing borates and silicates, and emitting into the arc a conducting vapor, which assists stability, lowers the hissing voltage, and gives a wide range of working tension.

In the United States, for home consumption only, an inferior kind of carbon is made from lamp-black and petroleum purified by acid. Such carbons must be made very soft, and must be plated with copper if intended for low-voltage lamps. The coppering of carbons has been abandoned in Europe, chiefly because the drops of molten copper affected the steadiness of the arc.

The density of average carbons varies from 1.30 to 1.35; the specific resistance varies from 0.005. to 0.1 in ohms and centimeters, and is generally about 0.008 or 0.0095. The cores usually contain 80 to 85 per cent. of carbon, 5 to 6 per cent. of water, and the rest is made up

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of silicates and borates. There is, however, no good test for the quality of a carbon other than its actual use in a lamp.

The proper diffusion of the light is now effected more thoroughly than formerly by the use of reflectors, opaline globes, holophanes, diffusers, etc., and also by the employment of inverted arcs whose light is reflected from a whitened ceiling or from special reflectors.

The photometry of the arc lamp has lapsed into confusion, for the horizontal candle-power maximum candle-powers, the mean spherical and the mean hemi-spherical candle-power are in common use, as well as a so-called "nominal" intensity. In any case, it is difficult to compare the results of two experimenters, on account of the insufficiency of definition of the arc. It is necessary to specify not only the current and terminal voltage, but also the diameter of the carbons, the voltage between their points, the length of the arc, and the kind of core in use. Moreover, to attain uniformity in results, it is necessary that the same standard of candle-power should be used by all the observers and that the tint of the light from the arc should be properly taken into account. The author and M. Jigouzo have found, by the aid of the lumenmeter, that the illumination produced is increased by a diminution of the diameter of the carbon following a law less simple, however, than that of Schreihage; and that it increases with the voltage up to a certain maximum depending on the current density, and then diminishes again. This maximum varies from 10 lumens to 25 lumens (0.8 candle to 2 candles) mean spherical per watt for the continuous current, and from 5 lumens to 17.5 lumens (0.4 candle to 1.4 candles) for the alternating current. Wedding's experiments, by other methods, showed, besides the influence of the diameter of the carbon on the photometric curve, the direction of the maximum candle-power is raised towards the horizon when the current density increases, and at the same time the ratio of the horizontal to the maximum intensity increases from one-fifth to one-half. Finally, an all-round comparison shows that the consumption per Hefner candle of the mean hemi-spherical candle-power is about 1.1 watts in 200 watt alternate-current lamps or in 60 watt continuous-current lamps, and is 0.68 watt in 1,100 watt alternating, or 150 watt continuous-current lamps. This great difference is partially compensated by the replacement in alternate-current lamps of the steadying resistance by a self-induction coil.

In enclosed arc lamps, supplied with 75 volts to 80 volts, the arc is perpetually undergoing irregular displacements, but the total luminous flux varies little. The diffusing globe absorbs 30 per cent. to 40 per cent. of the light produced. The yield of an enclosed arc seems to be about two-thirds of that of a good open arc lamp of the same power. The measurements by Wedding, Gérard and De Bast, have shown that the enclosed arc is not more economical than an incandescent lamp. Yet other experimenters, Friedman, Burrow and Rapaport, by reducing the diameter of the carbons, have shown the reverse. Still, the enclosed arc seems notably inferior to the open arc with regard to the energy consumption. Undoubtedly, with alternating currents the enclosed arc is considerably inferior to the ordinary incandescent lamp.

Progress in Incandescent Lamps.—The uniformity in the manufacture, the efficiency, the durability, and the price of incandescent lamps, have all altered for the better. The carbon filament lamp remains easily the most-used form of the incandescent lamp. It is usually employed in sizes of from 8 candles to 36 candles, exceptionally from 50 candles to 100 candles. The yellowish light it affords is rather in their favor than otherwise.

From the theoretical point of view it is regrettable that the rating of lamps by the method, proposed in 1899,by M. Crova, by defining their degree of incandescence, has not been applied in practice. This method makes easy the determination of the temperature of the filament. According to Weber this temperature reaches from 1,565 degs. C. to 1,588 degs. C. and even 40 degrees higher for lamps with larger filaments. Le Chatelier finds the temperature to be about 1,800 degs. C., while Janet deduced 1,610 degs., to 1,720 degs. for 16-candle lamps at 65 volts. Le Chatelier's method, in which the intrinsic brilliancy of the filament is assumed to depend only on the temperature and the condition of the surface of the filament, is open to objection on account of the evident transparency of the material of the filament. The increase of resistance with temperature is greatly concerned with the structure of the filament; for Howell has shown that the resistance of the core of a filament diminishes as the temperature increases, while the resistance of the layer of deposited carbon, like that of graphite, increases with the temperature. Hence it is possible that the resistace of a filament at some temperatures becomes stationary or possesses even a negative temperature coefficient.

On the whole the last 10 years have witnessed few changes of importance in the manufacture of incandescent lamps, but very great improvements in every detail of the complete lamp have taken place. The modern process of "squirting" cellulose dissolved in zinc chloride, alcohol-ether, sulphuric acid, etc., to form the filaments have almost completely replaced the old processes of Swan and Edison for ordinary filaments. For very large filaments a carbon paste similar to that used for arc lamp carbons is usually employed. The carbonization of the raw filament by incandescence in the hydrocarbon vapor remains still almost essential because it retards the blackening of the globe of the lamp, and permits, of a great modification of the resistance of the filament, the conductivity of the deposited carbon being eight or ten times that of the body of the filament. Unfortunately this change of resistance is still found to be difficult of regulation. Nowadays also the vacuum is much more nearly perfect. Powerful mercury pumps follow the application of mechanical air-pumps when these have reduced the pressure to half a millimeter of mercury; or sometimes, a process of chemical exhaustion replaces the mercury pump. The attachment of the filament to the leads, too, has been changed, perhaps for the worse, by the adoption of a process which bakes on to the joint a paste of carbon and tar. Nickel and ferro-nickel leads have been tried, but it seems better instead of entirely replacing the platinum to make the platinum portion of the leads as short and thin as possible.

Least progress of all has been made in the light-yield, referred usually to the maximum horizontal candle-power. Normally, the mean consumption is 3.5 watts per bougie decimale, unless the lamp is used at higher pressure than its proper voltage. Weissmann and the author by the use of low-pressure lamps have reduced safely the consumption to 2.5 watts per candle. The increase in the number of the 220 volt systems has caused manufacturers to develop a single-filament lamp working directly at 220 volts, but the construction of these lamps is more difficult, and variations of voltage have more effect than in the case with the lower-pressure lamps. These lamps, too, have proved less durable than the corresponding 110 volt lamp, they cannot be made to give satisfactorily low candle-powers, while their expenditure of energy per candle-power increases rather quickly with time. The future high-voltage lamp will probably employ a filament of higher resistance than the carbon filament.

Many experimenters have endeavored to make filaments of other refractory substances than the carbon, such as the carbides of boron, silicon, aluminum, calcium, etc., but have not attained complete success. Langhans uses a filament of cellulose mixed with powdered boron or silicon; Maxim uses a modified form of carbon filament which is made from a crystalline carbon powder made into a paste with tar. Welsbach makes filaments by heating a platinum wire in an atmosphere of hydrocarbons, water vapor, and osmium anhydride. The latter filaments, though very efficient, are expensive and can be used only with pressures of from 20 volts to 30 volts. The use of the rare earths in this connection seem very promising: Various investigators have endeavored to cover carbon filament with these substances both by electro-chemical processes and by the application of pastes. The chief difficulty in the way seems to be the difference between the coefficients of expansion of the carbon core and the deposited oxides. Chromium, tungsten, platinum, iridium, etc., have all been used to replace carbon, but with small success. Welsbach, however, has made a filament of thoria, deposited on platinum or osmium, which consumes only 1.5 watts per candle, but the lamps so made are very expensive.

Jablochkoff, in 1877, and Nernst, in 1897, made use of the property, described by M. Roux, which the oxides and analogous substances possess of becoming conductive at a fairly high temperature. Nernst has made the necessary preliminary heating automatic by placing a spiral platinum wire near the filament; he uses also oxides of greater conductivity than ever used before. These lamps give a very white light, produced by the expenditure of energy, at the rate of 1.75 watts per candle in a 25-candle lamp, and 1.00 watts per candle in a 100 candle lamp. The presence of air, or at any rate an oxidizing atmosphere is necessary to prevent electrolytic decomposition of the filament. It is to be feared that variations of voltage may have rather a large effect, and in any case, a steadying resistance is necessary. Lamps of less than 25 candles, or less than 110 volts, have not yet been made, but high-voltage lamps are easily obtainable.

The rating of incandescent lamps varies from country to country. In France the "bougie decimale," and in Germany and America the Hefner, are the common units of illumination. In France the horizontal candle power perpendicular to the loop of the filament is measured; in other countries the mean of the candle-powers in several directions is taken. The German Electrical Association lays down that lamps should bear an indication of the power and voltage to within 2 per cent., and that the life of a lamp be defined by the time in which the candle power falls 20 per cent.

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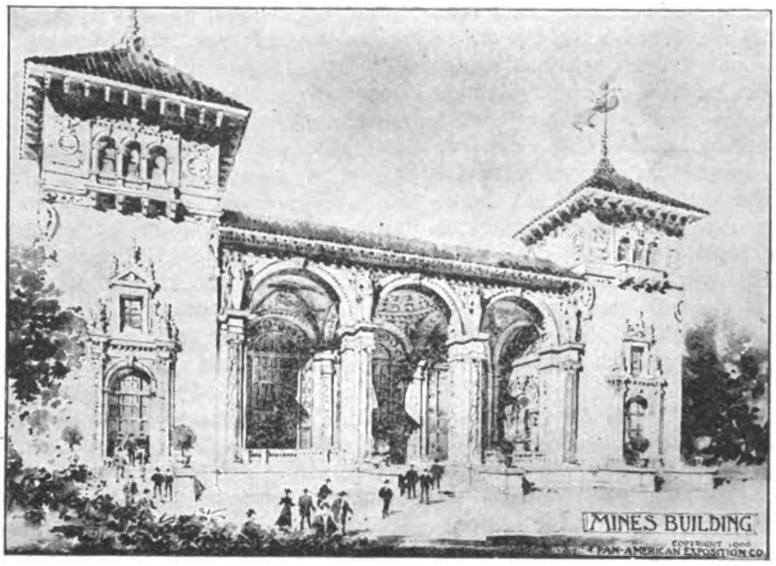
THE MINING EXHIBITS AT THE PAN-AMERICAN EXPOSITION.

No feature of the Pan-American Exposition will be of more importance than the exhibit of mines, and metallurgy. The building to be devoted to these exhibits is one of a group of three magnificent structures, arranged in the form of a horseshoe, at the western boundary of the Esplanade. The Mines Building is the southernmost of the group and is connected with the Horticultural Building by one of the conservatories whch flank the Horticultural Building on the north and south. It is 150 feet square and at each of the four corners it has a square tower 90 feet high. The eastern facade looking upon the Esplanade, shows three high recessed arches between the towers, forming an open loggia elaborately and beautifully ornamented with plastic detail and decorated in brilliant colors. From this loggia are the main entrances to the building. There are also entrances in the corner towers. The ornamental detail is very picturesque and interesting. The design is by Peabody & Stearns of Boston.



Mines Building at the Pan-American Exposition.

Never was the science of metallurgy or skill in mining more highly developed than in the present day. The golden decorations of King Solomon's Temple are estimated to have cost $250,000,000. Ever since the account in the Book of Genesis of finding gold along the river Pison, a stream which flows from the Garden of Eden, the seeking for and mining gold has been one of the most fascinating industries. The production of gold throughout the world during the present century has steadily increased. The production in the United States in 1899 amounted to $72,500,000 while that of the whole world is given at $315,000,000 thus giving the United States the first position in production of gold of any country. In the matter of copper the United States produces 223,000 tons annually, or more than one-half of the world's output. The United States and Mexico are the two greatest silver producing countries. In other mining productions, the commercial value of which is considerably greater than that of the precious metals, the countries of Pan-America also lead the world. During the last year the coal output of the United States reached the enormous amount of 225,000,000 tons. This, as compared with Great Britan's output of about 200,000,000 tons and Germany's 100,000,000 tons, makes the question of the future production of coal, considering the rapid increase in America and the fact that European production has reached its limit and is already declining, especially noteworthy at this time. The Canadian output of coal and iron is an item of great importance. The near proximity of iron and coking coal and the proper fluxes gives Canada a great advantage in the manufacture of iron and steel. The advancement of these industries in North America during the past decade are phenomenal, the total production of the United States last year amounting in value to $413,758,414 and of non-metallic substances to a total of $601,872,631.

Besides the ordinary mining industries there are many others with which the general public is but little acquainted. Southern California has immense deposits of asphaltum which are merely waiting the necessary capital and transportation for their development. California is also producing tin ore containing from 3 to 6 per cent. of metal. The value of this may be estimated from a contrast with the Tasmania mines which assay about 2 per cent. A great many productions, such as diamonds, amethysts and other precious stones; mica, asbestos, zinc, aluminum, peat and salt belong also in this classification. The prosperity of nearly all the countries of the Western world is largely due to their mineral wealth. Much of the manufacturing depends for success upon these productions and the ease with which they are obtained is what gives these Western States and nations the advantage over older countries in this respect. The exhibit of mines and metallurgy at the Pan-American Exposition will illustrate graphically these advantages and will add greatly to the general knowledge upon the subject.

Electric Power and Fire Engines.

The chief fire engineer of the New Orleans, La., department has figured out that the relative running cost as between a three-horse hitch engine of the first class and an electric power engine is $60 a month for the former and $27 for the same period for the latter. These figures show a clear gain of $33 per month, and $400 per annum, in round figures for the electric power engine.

LONDON NOTES.

(From our London Correspondent.)

Electric Traction on the Underground.

It has now been decided that all tenders and schemes for the conversion of the Metropolitan and Metropolitan District railways to electrical working must be lodged in London by December 1. The matter is in the hands of the Electrical Traction Joint Committee, which consists of representatives of the two companies. The present increasing unpopularity of the railways, and the growing popularity of the Central London are rendering it imperative that the change to electricity must be made at once if it is to save the concern.

The City of London Electricity Supply.

In the annual report of Mr. Voysey, the City of London Corporation's electrical inspector, it is stated that there are now in the city district 507 arc lamps. The police reported 562 lamp failures, and the inspector 356, and penalties amounting to about £173 were inflicted. It is remarked that the Corporation is still without means for testing the value of the public lighting supply, as the Board of Trade has not formally approved of any type of instrument for the purpose. The question of lighting the side streets by electricity still hangs fire. Important experiments were made some years ago with a view of deciding what would be the best method of suspending fittings, and whether arcs or incandescents should be employed, and what candle power would be requisite for effective illumination of these dull narrow streets and courts which abound within the city district. During the year the inspector reports that there were two important interruptions in the supply of energy to private consumers; one affected the entire city area, and the other only a portion of it. On eleven different occasions, however, the pressure was defective. Efforts are being made to compel the City of London Electric Lighting Company to provide adequate means for the inspector to ascertain how far the company complied with its obligations in respect of the maintenance of a proper pressure of supply to private consumers. Arrangements have been made for the testing of meters at the Guildhall without expense to the Corporation.

Accidents in Electricity Works.

Great precautions have been made for some years past to have posted upon the walls of English electricity works full instructions showing the most approved methods of dealing with those who are affected by electric shock by any mishap or other. It is, however, remarkable that those in whose interests they are drawn up with explanatory photographs, pay little heed to them; hence occasions have arisen when assistants have not known how to set to work upon an unfortunate comrade. It is, however, perfectly true that in other cases these rules have been carried out with very satisfactory results. Only a short time ago a young switchboard attendant working at the switchboard of the Blackheath and Greenwich polyphase station was killed by a shock, and in the course of evidence at the inquest the electrical engineer in charge of the works admitted that although (after a previous similar accident to a lad in February last), the Home Office Dangerous Trades Committee sent certain regulations to prevent accidents in elec-

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tric generating works, he had not even read them all.

Higher Voltage Supply.

In certain of the London districts the large Electricity Supply Companies when desiring to change their consumers over from 100 to 200 volts have been seriously hampered by a few consumers here and there who have held out doggedly against any alteration. These obstructive consumers have had to be dealt with in such a way that they pay the maximum charge per unit while their neighbors are supplied at about 3d. per unit less. This move on the part of the companies has led the London County Council to make a counter move on behalf of consumers with a view of getting the maximum permissible charge reduced from 8d. to 5d. whatever the voltage. The Board of Trade has been duly appealed to with this end in view, but it has deferred any action in regard to the matter at present because it has under consideration the question of imposing a sliding scale of charges upon all electric lighting companies throughout the Kingdom.

THE ELECTRIC STATION OF THE EIFFEL TOWER.

BY L. FOURNIER.

Translated for ELECTRICITY from "La Vie Scientifique, Paris, France.

Electric current is furnished the projectors and the beacon on the Eiffel Tower through a system of wiring which conforms to the edges of the tower.

Besides the innumerable light rays sent in all directions by this means, the Eiffel Tower is provided with a powerful system of illumination which at night gives it the appearance of being on fire; the arches and the outer framework, together with the first and second stories, all decorated with multi-colored lights, appear to form a garland for the neighboring palaces, and increase the effect of their illumination.

Having once witnessed this spectacle, we realize the enormous amount of electricity necessary to furnish light for all these thousands of lamps, and we become curious to know where the generators are to be found.

If we walk up to the first story we will find in the south pillar a stairway which leads to an underground room roofed over with glass, containing the machine which furnishes power for the elevators and current for the lamps; this installation is made up of five electric generator groups, each of different power.

The two largest comprise a compound Carels high speed engine, making 325 revolutions per minute, and operating through a Zodel coupling a Sautter-Harlé dynamo of 230 kilowatts at 130 volts. It is a continuous current multipolar dynamo, provided with six sets of carbon brushes, each set containing 17 individual pieces.

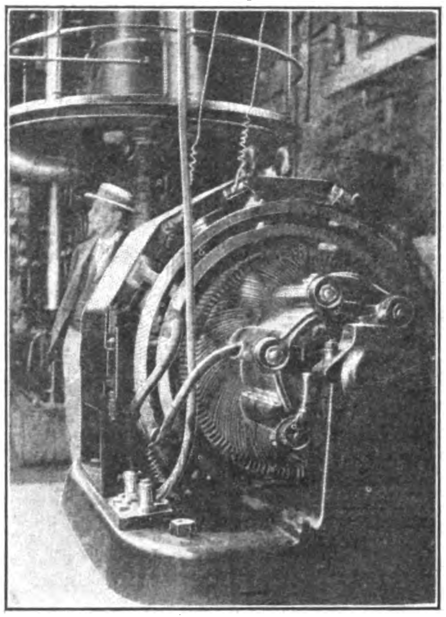
The field is connected in a shunt circuit and contains six pole pieces, between which are placed six additional complementary poles connected in series and serving as magnetic field governors, in other words, to maintain a constant current at the brushes whatever may be the demands on the generator. Two smaller generators are placed near them, each driven by the Sautter-Harlé type of vertical compound engines driving through leather belts. The output of these dynamos is 52 kilowatts at 130 volts; they have an armature speed of 350 revolutions per minute, there are four pole pieces and four sets of carbon brushes each containing ten units; these as well as all the other dynamos built by Sautter-Harlé & Company are furnished with pillow block ring oil boxes containing anti-friction metal axle bearings, composed of an alloy of copper, tin and antimony.

The axle bearings are pivotally suspended to allow the axle to maintain a free position without fear of heating. The magnetic circuit throughout is a steel casting.

The four dynamos just described can be connected in parallel at the switchboard, and they furnish all the lighting current for the Tower.

The fifth generator group is used for day work only, to drive ventilators and furnish current for lighting the cellars and the restaurant kitchens.

The driving power is a Sautter-Harlé single cylinder vertical engine with a leather belt connection to a four pole dynamo of 8 kilowatts



ONE OF THE EIFFEL TOWER LARGE DYNAMOS.

at 130 volts. The construction is practically the same as in the one already described.

The cable conductors of the day circuit lead from the generators to a two pole circuit breaker and switch by which the current may be switched into the day circuit or to the switchboard.

The distributing switchboard was constructed by Mornat and Langlios under the superintendence of the electrical department of the Eiffel Tower; the material of which it is constructed is white marble 5¼ meters long by $2\frac{7}{10}$ meters high with three panels. The center panel contains the connecting and regulating apparatus comprising an ampere meter, a cutout, and a rheostat dial for each of the four principal generators, and in addition there are two voltmeters, one of them is connected to the bus bars and the other may be placed in circuit with the terminals of each of the four dynamos by means of a four-way switch.

Both the ammeters and the voltmeters are of the dead beat type and were constructed by Chauvin & Arnoux.

The ordininary lighting circuit terminates at the left hand panel; there are fourteen of them branching to all parts of the tower, beacon, projector No. 1, also No. 2, Russian-French restaurant, outside stairway, north, south, east pillars, etc.

In each of these circuits is to be found a bipolar circuit breaker and an ampere-meter.

The illuminating circuits are connected to the right hand panel of the switchboard, in which are placed those lamps that are mounted on reflectors and located along the outer edges of the tower. There are fifteen of these circuits corresponding to the four sides of the tower, the staircases, the roof edges of the first and second stories etc.

These fifteen sections are independently manipulated at the board and comprise 4,200 incandescent lamps of ten candle power each, while the ordinary lighting circuits first mentioned comprise the beacon light, the three projectors, 2,000 incandescent lamps of 10 candle power each, with the exception of a few of 16 candles, and 24 arc lamps of 8 amperes, altogether requiring 1,100 amperes at 130 volts, while the maximum capacity of the board is 2,500 amperes at 130 volts.

The total number of circuits in the Eiffel Tower system therefore is twenty-nine; all conducting cables are insulated and strung on two and three petticoat insulators.

PROFESSOR PERRY'S PRESIDENTIAL ADDRESS.

[From our London Correspondent.]

On Thursday, November 8, Professor John Perry, F.R.S., delivered his inaugural address for the 1900-1901 session to the members of the Institution of Electrical Engineers.

On the subject of standardization he stated that his hearers "must have noticed that the American engineers, who surely deserved the character of being practical idealists above all other engineers, are the men who are most imbued with notions of standardization which lead to cheapness of manufacture, and they are also the men most alive to the necessity for occasional extensive scrapping of types of machinery when they become even a little antiquated." Other extracts are as follows: Our knowledge of electrical phenomena must be quantitative to be of practical use; we must be able to calculate. Mathematics is the science of calculation and we must, therefore, be able to employ, and we all do necessarily employ, more or less mathematics every hour of our professional lives.

"As for the man who does understand electrical problems, he remembers that there was a something called a study of mathematics at his school, that he did pass certain examinations with much difficulty and tribulation, that the subject had no real meaning to him even when he was supposed to know it, and he now hates the sight of anything that looks like mathematics.

"Quite recently one of our most eminent members declared to me that he had not really grasped the reason for small economy at a power station when there is a small load factor, until he studied the common sense mathematical form which has been given in a recent publication. And yet he is a man who has heard, read and talked much on this subject.

"The fact is, mathematics ought to be the natural language of the electrical engineer, and at present it is a foreign language; we cannot read or write or think in it. We are at the beginning of our development,

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like monkeys whose necessities have increased faster than their powers of speech."

The production of electricity from coal, terrestrial magnetism and several other topics were briefly touched upon in the professor's very interesting address.

The New York Electrical Society.

The New York Electrical Society held its 209th meeting at the College of the City of New York on November 16th, when, before a very large and most appreciative audience, Mr. C. P. Steinmetz delivered a lecture on "Alternating Current Engineering." It may be said at once that no more valuable or interesting lecture has ever been delivered before the Society. In the course of about an hour and a half, supplemented by replies to suggestions, Mr. Steinmetz treated of the development of the alternating current for power and lighting purposes; its application for long distance work; its relation to continuous current local supply; questions of railway work; frequency, voltage, regulation, etc. While treating the subject broadly, Mr. Steinmetz presented a number of new facts and cleared up many obscurities in regard to the nature and use of alternating currents. At the close of the lecture and of the discussion, in which Messrs. Dunn, Henshaw, Burnett and Williams participated, Mr. Steinmetz, in response to a unanimous request, promised to put the lecture into written form so that it may be published by the Society.

The following is the list of members elected at the 209th meeting: H. S. Arnold, C. F. Splitdorf, G. H. Hill, J. S. Humbert, Chas. Arthur Hanna, David H. Darrin, M. R. Hutchinson, C. Howard Parmly, C. W. Obert, Robert A. Fliess, Howard Richards, Jr., Edward R. Knowles, New York City; H. G. Osburn, Hoboken, N. J.; Harry B. Naylor, Newark, N. J.; W. W. Morse, West Orange, N. J.; E. M. Archibald, Ampere, N. J.

LEGAL NOTE.

Upon application of the American Loan and Trust Company of Boston, the Dallas Electric Company of Texas has been placed in the hands of a receiver by Federal Judge Meek. The receiver is E. M. Reardon, who has given bond for $20,000, and taken charge of the property. Default in the payment of interest on $300,000 worth of the Dallas Company's bonds, which were held by the Boston corporation, was the cause of the action.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended November 15:

Antwerp, 32 cases, $3,986; Argentine Republic, 45 packages, $2,585; Australia, 164 packages, $3,831; 37 cases, $10,355; Bremen, 7 cases, $469; British Guiana, 274 packages, $2,902; British West Indies, 13 packages, $340; British Possessions in Africa, 264 cases, $14,702; Central America, 55 packages, $2,396; Cuba, 9 packages, $180; 186 packages electric railway material, $15,448; Dunkirk, 12 packages, $4,157; Fiume, 1 case, $22; Glasgow, 196 packages, $53,776; 29 electric cable reels, $13,720; 3 cases, $372; Hamburg, 70 packages, $3,843; Havre, 89 packages, $4,984; London, 210 cases, $5,006, 81 packages, $7,389; Liverpool, 133 packages, $6,978; Mexico, 190 packages, $239; 3 cases, $642; New Foundland, 9 packages, 203; New Zealand, 3 packages, $110; Nova Scotia, 34 cases, $1,098; Peru, 6 cases, $598; Santo Domingo, 2 cases, $34; Southampton, 6 cases, $365; 8 packages, $277.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Lakefield Portland Cement Company, of Lakefield, Ont., will have its works operated entirely by electricity. The water power is situated about 5 miles from the works, to which electric current will be transmitted at a pressure of 100,000 volts, by a 600-horse power generator, and, transformed at a sub-station at the works.

The Montreal Electric Street Railway Company has introduced an innovation in street railway building in the reconstruction of its track on St. James street in that city. Steel ties, to which the rails are firmly bolted, are used. The system has been tried in India and various countries in the tropics, and it is understood has given much satisfaction.

The initial installation at the works of the Chambly Manufacturing Company, at Chambly, Que., from which point current is transmitted direct to the city of Montreal, 17 miles distant, consisted of four two-phase generators of 2,000 kw. capacity each, wound to generate current at 12,000 volts. The plant was so designed, however, as to provide for the installation of eight machines of the same capacity. The demand for power has been so great that the Chambly Company has found it necessary to install the additional equipment originally provided for, and accordingly the four additional generators will be wound for 2,200 volts, and by means of transformers the current will be stepped up to 12,000 volts for distribution over the circuits.

PERSONAL MENTION.

Mr. Frank Jarvis Patten, the inventor of the multiplex telegraph system, which was purchased by the Western Union Telegraph Company, and of the gyroscope, used for giving the position of a vessel in mid-ocean, died suddenly last week in this city.

Mr. E. J. Chebas, an electrical engineer of Santiago, Cuba, has been spending some time in Pittsburg, Pa., in relation to the establishing of an electric light plant at Santiago.

Mr. Frederick W. Royce, known as an inventor, electrician and veteran telegraph operator, dropped dead from apoplexy in Washington, D. C., November 16.

Mr. Joseph C. Lugar, general superintendent of the Wilmington, Del., City Railway Company, is visiting Chicago and other Western cities where he will study the trolley systems.

INCORPORATIONS.

The Richmond Electric & Power Company, Frankfort, Ky. Capital stock, $9,000.

The Railway Electric Refrigerating Company, New York City. Capital stock, $6,000,000.

The Consolidated Safety Third-Rail Electric Company, New York City. Capital stock, $100,000.

The Franklin Electrotype Company, New York City. Capital stock, $5,000. Directors: William L. Columbine and J. T. Allaire, Brooklyn, and T. H. Allaire, Red Hook, N. J.

The American Light, Power & Transportation Company, Trenton, N. J.—to operate electrical works. Capital stock, $1,000,000. Incorporators: W. A. Jones, E. D. Conklin and F. P. Crain.

The Newburgh Light, Heat & Power Company, Newburgh, N. Y.—to manufacture gas and electricity. Capital stock, $500,000. Directors: J. L. Wilkie. W. B. Goodwin and Moses Ely, New York City.

The South Boston Electric Light & Power Company, South Boston, Mass.—to maintain and operate an electric plant. Capital stock, $200,000. Incorporators: R. W. Lawson, J. J. Lawson, R. S. Barbour, J. Stebbins, all of South Boston; R. H. Easley, of Houston; E. Schaefer, of Lynchburg.

The Dunsbach Ferry Electric Company, Half Moon, N. Y. —to furnish electricity for lighting, heat and power purposes in Watervliet and Half Moon. Capital stock, $100,000. Directors: Henry W. Miller and Alfred H. Dobson, Utica; Francis W. Marsh, Ebenezer Burr and John C. Chamberlain, Bridgeport, Conn.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED NOVEMBER 13, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

661,516. Trolley. Henry S. Goughnour, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed March 21, 1900.

661,600. Trolley Wheel. Thomas I. Duffy and Charles S. McMahan, Chicago, Ill.; said Duffy assignor to said McMahan. Filed July 16, 1900.

661,926. Toy Trolley-Car System. Charles F. Agor, Shrub Oak, N. Y. Filed July 5, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

661,505. Illuminating Device. Leonard Erikson, Boston, Mass. Filed March 17, 1900.

661,839. Dash-Pot for Electric-Arc Lamps. Thomas E. Adams, Cleveland, O. Filed May 7, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

661,719. Rectifier of Alternating Polyphase Currents. Louis H. Haynes, Newton, Mass. Filed Dec. 30, 1899.

661,742. Circuit-Controller for Electric Engines. Henri Letord, Orlando, Fla., and Joseph S. Letord, Kansas City, Mo. Filed Feb. 27, 1900.

661,771. Electric-Circuit Breaker. Benjamin P. Rucker, Philadelphia, Pa. Filed June 25, 1900.

661,880. Electric Brake-Controller. John C. Lincoln, Cleveland, O., assignor to Arthur L. Garford, Elyria, O. Filed Oct. 2, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

661,578. Toll-Collecting Device for Telephones. William A Foss, Cleveland, O., assignor to the American Toll Telephone Company, same place. Filed July 26, 1900.

661,714. Telephone-Circuit. Isaiah H. Farnham, Wellesley, and George W. Davis. Revere, Mass., assignors to the New England Telephone & Telegraph Company, Boston, Mass. Filed May 11, 1900.

MISCELLANEOUS.

661,491. Emergency-Brake Switch. William M. Brown, Johnstown, Pa. Filed Oct. 14, 1898.

661,498. Electric Fuse. Joshua L. Cohen, New York City. assignor of fifty-one one-hundredths to Herschel P. Copeland, Jersey City, N. J. Filed Jan. 4, 1900.

661,518. Controlling Device for Electric Circuits. Edward W. Hammer, Chicago, Ill. Filed Aug. 31, 1899.

661,538. Brush-Holder for Dynamo-Electric Machines. Christian W. Kragh, Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed Sept. 11, 1899.

661,555. Fire-Alarm. Alfred A. Ross, Montgomery, Ala. Filed March 15, 1900.

661,588-661,589. Electric Welding Apparatus. Adolf F. Rietzel, Lynn, Mass., assignor to the Thomson Electric Welding Company, same place. Filed June 1, 1899, Sept. 23, 1899.

631,616. Alarm and Releasing Mechanism for Fire-Engine Houses. Edward P. Matter, Alexandria, Va. Filed March 13, 1900.

661,666. System of Electric Train Control. Charles B. Martin, New York City. assignor to the General Electric Company of New York. Filed Oct. 23, 1897.

661,669. Connecting Conductors to Carbon Brushes. Albert L. Rohrer, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 22, 1898.

661,736. Fire-Alarm. Oskar Freymann, New York City, assignor of one-fourth to Charles Tolman, same place. Filed Nov. 17, 1899.

661,820. Electrical Apparatus. Martin Schupner, Nyack, N. Y. Filed June 16, 1900.

661,881. Electric Meter. Charles W. G. Little, Heckington, Eng. Filed Sept. 4, 1900.

REISSUE.

11,872. Traveling Contact for Electric Railways. Thomson-Houston Electric Company, Boston, Mass., assignee of Albert Wahl and C. A. Coffin, administrators of Charles J. Van Depoele, deceased. Filed Sept. 28, 1900. Original No. 495,413, dated April 11, 1893.

COMMERCIAL PARAGRAPH.

We are in receipt of a very handsomely gotten up catalogue issued by Manning, Maxwell & Moore, 85-89 Liberty street, New York, which contains over 700 pages of interesting reading matter and illustrations. This volume, which treats of metal and wood working machine tools and attachments should be in the hands of all those interested in this line of work. This well-known concern has in New York three large warehouses filled with machinery for prompt delivery. In Chicago they have a very complete establishment at 22-24-26 South Canal street, which is stocked with a full assortment of the latest improved machine tools for quick delivery. They have an office at 1005 Park Building, Pittsburg, Pa., in charge of a corps of able assistants, and one at 1020 Williamson Building, Cleveland, Ohio, where prompt attention will be given to inquiries.

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THE TELEPHONE WORLD.

'Phones for Trolley Cars.

Superintendent Townsend of the Meriden-Southington, (Conn.) line announces that at an early date all cars of that line will be equipped with telephones, so that in case of delay or trouble the office and power station may be promptly notified. He says the order for the telephones has already been placed. They are made by the Connecticut Telephone Company of Meriden and are operated by raising a wire by a light pole to a wire paralleling the trolley wire. The system is the best so far developed, and will undoubtedly be appreciated by the public. The superintendent's house has already been connected by telephone with the office and power station, being part of the car system to be inaugurated.

The Greeley, Col., Independent Telephone Company, which has lately been incorporated by several prominent citizens of that city, has met with much success. An exchange has just been installed in Evans with twenty-eight telephones. The company has been granted a franchise in Greeley, subject to an ordinance which will shortly be granted. As soon as enough telephone poles have arrived work will be started on an exchange for Greeley. Already about 175 people have pledged themselves as subscribers. When the work in Greeley has been completed an exchange will be established in Easton, and so on until the system reaches all the principal towns of Weld County. The object of the company is to connect the surrounding towns with the county seat.

The Cumberland Telephone Company, which some time ago bought up all opposition and competition in New Orleans, La., and then almost doubled its rates, has won a victory over the Board of Trade and a number of individual citizens who brought suit before the State Railroad Commission against the concern. The commission refused to issue an order reducing the telephone charges in New Orleans, and now the Cumberland people may raise or lower the rates at will. There is great dissatisfaction over the decision, the business men contending that the city is now at the mercy of a grasping monopoly which will exist until the franchise runs out. The Cumberland Company owns two franchises covering the entire city.

The Dutchess County Telephone Company, with principal office at Poughkeepsie, N. Y., and having a capital stock of $125,000, recently filed articles of incorporation with the Secretary of State. The general route will take in the city of Poughkeepsie, the principal towns, villages and cities of Dutchess County, the State counties adjoining Dutchess County, and that portion of the State of Connecticut which adjoins Dutchess County. The directors are: A. A. McGlashan Myndert, J. Van Kleeck of New York City; H. A. Tucker, Asa Lippincott, of Brooklyn; George W. Sutton, John H. Scofield and Arthur E. Waldradt of New Rochelle.

The business of the Southern New England Telephone Company, says a New Haven, Conn., paper, is constantly growing and the officials are not able to keep up with the orders. The large force of mechanics are constantly employed in getting out new instruments and new stations are being equipped in all parts of the State. In September the company put in 253 new stations. In October the number was 221 and thus far this month 82 new stations have been established and there are 51 unfilled orders. This increase is not abnormal the company having maintained that gait for a long time.

There is quite a local interest manifested in the establishment of a telephone line in West Sumner, Me. To that end the Oxford Telephone Company has been organized with a capital of $800 to run a line through the towns of Buckfield, Sumner, Paris, Woodstock and Greenwood. Work has already begun and it will soon be complete. The company was formed as follows: E. H. Andrews, president; H. W. Dunham and S. F. Stetson, vice-presidents; G. A. Chandler, secretary; S. H. White, treasurer, and Geo. H. Plaisted, superintendent.

Preliminary steps have been taken to extend the Salt Lake City-Butte telephone lines to Boise, Idaho, by way of Pocatello and Blackfoot, Idaho. Connection will also be made by branch lines to Mountain Home and the Custer County mining camps.

A dispatch from Boston says of the entire output of telephones by the American Telephone & Telegraph Company for the ten months ending October 20, the Erie system has taken 29 per cent., represented in over 30,000 new subscribers; The average increase of the entire system in the United States, according to the output, has been 19 per cent.

The Exeter, N. H., Telephone Company has increased its capital stock from $2,000 to $5,000. A dividend of 6 per cent. was declared for the year ending November 1.

The differences between the town of Attleboro, Mass., and the Providence Telephone Company were lately settled, and the plans for a new exchange, made some time ago, will be carried out without delay. In four months Attleboro will have a modern exchange, and overhead wires will be removed from three miles of streets, the total length of the ducts being 20,000 feet. Each cable contains from 120 to 200 pairs of wires, and this indicates that ample provision has been made for increased demand for telephone facilities in Attleboro.

Cheap telephone service is one of the comforts of life in Kokomo, Ind., at present. A competing plant has been put in by a local company. The Bell Company up to the arrival of the competitor charged $3 per month for business houses and $2 for residences. The new company put the prices at $1.25 and $2. This came so nearly putting the old company out of the business that the latter is contracting for fifty cents per month, with either monthly or yearly contracts. The Citizens' Company still adheres to its original rate of $1.25, and has yearly contracts with 600 subscribers. The Bell Company never had more than 300.

The sub-station of the Chesapeake & Ohio Telephone Company at Georgetown, D. C., is rapidly nearing completion, and will most likely be ready by the latter part of the present month. It is stated that the company is anxious to have the plant in working order by the time Congress again commences its sessions. The wires for this section have all been put in order, and will require but a short time to connect with the new station.

R. E. Lee of New Orleans, La., representing the Cumberland Telephone Company, has lately been at Opelousas, La., for the purpose of placing an exchange there. At a meeting of the board of aldermen a franchise was given the company to operate in that place. Mr. Lee has met with much success. The company expects to begin operations there at once. At present the town has the Birtha Telephone Exchange in operation, which it is expected will fight the Cumberland people.

The Mexican Telephone Company has recently completed the extension of its metallic system in the City of Mexico. The entire business section of that city now has a metallic 'phone system whereas heretofore but a small area was thus supplied. The work upon the extension was commenced last spring, and has cost about $22,000, which sum has been paid from the earnings of the company.

The Home Telephone Company of Florence, S. C., celebrated its first birthday this month. In that city there are now 106 telephones, and the exchange can give on call more than 50 connections. This is exclusive of those small places where there are but two or three 'phones connected. The Home Company has prospered greatly, and the prospects for its future are very bright.

From Minneapolis, Minn., comes an announcement that the Northwestern Telephone Exchange reports a net gain of 397 subscribers in October, making a total number of 21,023 subscribers October 31. The Erie Telephone system, which includes this company, reports a net gain of 2,644 subscribers in October, making a total number of 137,214 subscribers of this system October 31.

W. D. Meadaris, manager of the Cumberland Telephone Company at Fayetteville, has been in Lynchburg, Tenn., with a view of establishing a local exchange. It is thought that the citizens of the town will give the necessary encouragement to the proposition, and that the exchange will be put in.

The Norfolk, Va., city council has decided that the Southern Bell Telephone Company may remain undisturbed in possession of its franchise, which allows it to fix rates as high as it wishes. The Southern Bell Company objected to the fixing of a maximum rate and recently increased its charges 100 per cent.

Samuel B. Rawson, of Elyria, O., president of the Home Telephone Company of Lockport, N. Y., has recently been looking after the construction work now in progress on the new line in Lockport. Mr. Rawson expressed himself as pleased with the progress the men are making and stated that it would be some time yet before the work of stringing the wires was taken up. The pole line in the central district will first be attended to.

In addition to conducting a general lighting and heating business one of the purposes of the Fruitvale Light, Power & Heat Company of Fruitvale, Cal., is said to be the establishment and operation of a telephone business.

Spencer, Mass., is to have a Citizens' Telephone Company to compete with the New England Telephone & Telegraph Company. It has been organized with a capital stock of $20,000, and its promoters have great faith that it will go through. E. P. Cutter of Spencer called on the promoters of the Citizens' Telephone & Telegraph Company of Worcester not long ago and talked over matters with them. His principal object was to find out how they were going to secure their franchise. It is not the purpose of the Spencer Company to ally itself with the Worcester Company at the start, at least, but it may eventually come to this. This would be greatly to the advantage of the subscribers of the Spencer Company for it would give them direct communication with subscribers in Worcester, which they will not get from a purely local company. The affairs of the two companies have not advanced far enough to settle on anything like this yet, but both being antagonistic to the New England Company, they would naturally be more likely to pull together. The yearly telephone rental in Spencer is now $25 and the new company claims to be able to rent telephones and give a good service for $10 or $15 a year. The promoters claim they already have the names of many people who will become subscribers. Mr. Cutter, who is one of the most deeply interested in the company, said he believed the company would be doing a good business in Spencer before long.

It was announced in Baltimore, Md., on November 15, that negotiations are being conducted looking to the absorption of the Maryland Telephone Company of that city, the Pittsburg & Allegheny Telephone & Telegraph Company of Pittsburg, Pa., and the Delmarvia Telephone Company of Wilmington, Del., by the Erie Telegraph & Telephone Company. The three former corporations are controlled by a Baltimore syndicate. The deal, it is understood, is being arranged by Alexander Brown & Sons and George R. Webb, president of the Maryland Telephone & Telegraph Company. Alexander Brown refused to make a statement. The Maryland Company is capitalized at $1,000,000 with $1,000,000 of 5 per cent. bonds. The Pittsburg & Allegheny Company has $1,500,000 of stock and $1,200,000 of 5 per cent. bonds. The Erie Telephone & Telegraph Company is incorporated under the laws of New York, but is controlled by the New England people, the main office being in Lowell, Mass.

After several weeks' negotiations between the local company and the Southern Bell Company, West Point, Ga., is at last assured of first-class telephone service. For the past few months the telephone service has been unsatisfactory on account of the poor boxes. But before December 1 the best system that can be had will be established there. The local company will be reorganized under the name of the West Point Telephone & Electric Company, and Mr. J. Smith Lanier will be president and general manager. It will rent from the Bell Company all the telephones, using the new kind, that requires no ringing and the battery being operated by the central office. Nearly 150 telephones have been contracted for under the new system. The new central office will have direct connection with the long-distance telephone.

Edward Barkalow of the Kokomo, Ind., Telephone & Electric Company has secured a patent on a new telephone transmitter that amplifies sound. A test of 50 miles distance has been made by a whispered message at the receiving end, and the volume of sound was increased to the tone of an ordinary conversation at the other end of the line. The merit of the invention lies in the perfect privacy of the conversation.

The People's Mutual Telephone Company, incorporated in 1895, is now making active preparations to install an opposition telephone system in San Francisco, Cal. A thorough canvass of all telephone users is being made with gratifying results. The new company expects to be in operation within a year and a half. Business men will welcome any relief from the exorbitant charges and poor service now in vogue.

A new telephone line, starting at Upper Page Brook, and running directly to Binghamton, N. Y., is in the course of construction. When completed, this will make a continuous line from Greene to Binghamton.

One hundred and thirty-six telephones are used at La Grande, Ore.

A local telephone exchange was recently put in at Harrington, Wash.

TELEPHONE INCORPORATIONS.

The Continental Telephone Construction Company, Chicago, Ill. Capital stock, $2,500. Incorporators: Henry Shafer S. W. Moon, Frank L. Bills.

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GENERAL ELECTRICAL NEWS.

Lighting.

Appleton, Wis.—The Fox River Valley Electric Railway Company will construct a temporary electric light plant here and in the spring erect a permanent one.

Arkadelphia, Ark.—Capt. Albert Moore and his associates were lately granted a fifty-year franchise by the city council for putting in an electric light plant. They have to commence the work in sixty days, or the franchise will be void.

Ashland, Ky.—The Ohio Valley Electric Company will spend about $200,000 in enlarging its electric light plant.

Baldwin, Wis.—E. J. Cave has purchased the franchise and plant of the Baldwin Electric Light Company and will improve the system.

Beloit, Kan.—The electric light plant at the State Industrial School was recently destroyed by fire. The loss is estimated at $15,000.

Big Rapids, Mich.—This city will receive bids until December 3 for the furnishing of not less than 50 street lights. Bids are to be made for 1,200 and 2,000 candle power lights. Address city clerk.

Centralia, Ill.—The Centralia Light & Power Company is arranging to put in a third dynamo in its plant in order to meet the demand for incandescent lights.

Columbiana, O.—H. O. Brown contemplates erecting an electric light plant at this place.

Conway, Ark.—At a recent meeting of the town council an ordinance was adopted to lay off the town into one improvement district for the purpose of purchasing, owning and operating an electric light plant for lighting the streets and furnishing lights to individuals.

Dayton, O.—The car shops are putting in an extensive electric plant of its own at an expenditure of over $60,000. The company expects a contract shortly for 2,400 cars.

East Grand Forks, Minn.—The city council lately decided to establish an electric light plant and a water works system.

Herkimer, N. Y.—The contract for wiring the new St. Francis de Sales Church for electricity has been awarded to David Cronin of Syracuse.

London, O.—It was voted a short time ago to issue $5,000 worth of bonds for the purpose of purchasing new machinery for the electric light plant.

Manhattan Kan.—C. P. Demey has acquired the Manhattan electric light plant, and will extend and develop it.

Nashville, Tenn.—G. F. Bron of Philadelphia and T. Taylor of this city have submitted a proposition to the council to construct and operate an electric lighting plant for the city. An appropriation of $150,000 was authorized at a recent election for a new plant.

Neponset, Ill.—The citizens of this place are agitating the electric light question.

New London, Conn.—This city will remove all the naphtha lamps and replace them with electric lights.

Pitman Grove, N. J.—The plant of the Gloucester County Electric Light Company was recently damaged by fire.

Pratt City, Ala.—This city is considering the question of erecting an electric light plant.

Providence, R. I.—The work of placing the wires of the Narragansett Electric Lighting Company underground in the district bounded by the Providence River, Jackson, Pine and Washington streets, commenced about two years ago, is nearing completion, and in six weeks it is very probable that the highways in the area specified will be clear of wires and poles.

Red Lion, Pa.—The electric light plant here burned recently entailing a loss of $5,000.

Renovo, Pa.—There is talk of this place having electric lights before long.

Saratoga, Wyo.—It is proposed to erect an electric light plant on the Platte River. A. J. Doggett, mayor.

Selin's Grove, Pa.—At a special election in this borough the authorities were authorized to build an electric light plant at a cost of not more than $10,000.

Shreveport, La.—Bids will be received until December 1 for the electric lighting of this city for a period of five years from June 1, 1901. Address H. B. Murff.

Victoria, Tex.—The electric light works and other enterprises here are experiencing difficulty in replenishing depleted fuel supplies, and the wood yards are getting very short.

Wichita Falls, Tex.—An electric light plant is projected for this place.

Woodburn, Ore.—This place is to have an electric light plant; a 30-year franchise was recently granted to A. B. Kurtz by the council.

Street Railways.

Akron, O.—T. L. Childs has filed an application with the Stark County Commissioners for a franchise permitting the Canton & Akron Eectric Railway Company to run its line through Stark County from Canton northward.

Benton Harbor, Mich.—Plans for the construction of an electric railway through the center of the Michigan fruit belt are now being made by a number of Chicago capitalists headed by J. J. Sturm.

Bluffton, Ind.—J. M. Gore, promoter of the Indiana & Ohio Electric Railway Company, proposes to build a line between here and Muncie, Ind.

East McKeesport, Pa.—The East McKeesport Railway Company will erect a power house on property recently purchased between here and Wilmerding.

Goshen, Ind.—J. J. Burns is president of the Goshen, Wawaka & Southern Electric Railway Company, recently formed to build an electric line from this city to Wawaka.

Grand Rapids, Mich.—According to the statements of its promoters the electric railroad from this city to Ionia by way of Lowell and Saranac is now assured and the capital necessary to build and equip the road complete is not only in sight, but is secured by contracts.

Hackensack, N. J.—The Hoboken & Paterson Traction Company will pay $35,000 of the orignal cost of the bridge over the Hackensack River for permission to run its trolley cars over it. The rest of the expense will be borne by Bergen County.

Harrisburg, Pa.—The much talked-of trolley line project between this city and Lingiestown is now an assured fact. An organization has been effected by the election of president, Dr. C. H. Smith, Linglestown; secretary, George W. McIlhenny, Harrisburg, and treasurer J. G. Diffenderfer, Steelton.

Lyons, N. Y.—Chas. Van Voorhis and other members of the Cuyler-Morgan Railroad Syndicate have been inspecting the plans and routes for the proposed electric railway between this village and Sodus Point.

Omaha. Neb.—The Omaha & Fremont Railway Company has lately been incorporated for $750,000 by I Noyes, president; J. S. Knox of Omaha, secretary, and others. The new road will run between Omaha and Fremont, and the motive power will be electricity or compressed air.

Owosso, Mich.—J. D. H. Ralph, president of the Owosso & Corunna Electric Company, has sold the electric line which runs between the two towns to parties in Philadelphia. The new owners will extend the line and make many improvements.

Peekskill, N. Y.—A mortgage for $750,000 was filed a short time ago in the Register's office of Westchester County by the Peekskill Lighting & Railroad Company to enable it to make extensions on its lines in the northern part of the county and Connecticut.

Philadelphia, Pa.—The League Island Navy Yard will shortly enjoy the advantages of a trolley line. Major Wolcott, civil engineer at the yard, is superintending the building of the line and hopes to have it in operation by Thanksgiving Day.—The Inland Trolley Company is preparing to begin work on its line from Chestnut Hill northward toward Ft. Washton and North Wales.

Rockford, Ill.—President W. W. Clough of the Rockford, Beloit & Janesville Electric Railway Company states that the northern line will be constructed, equipped and in operation by July 1.—The Rockford Railway Light & Power Company expects to build the Belvidere line in early summer if the necessary franchises are secured.

Rushville, Ind.—A corps of engineers under the charge of Mr. Horton recently completed a preliminary survey of the route of the proposed Indianapolis, Morristown & Rushville Electric Railway.

Santa Fe, N. M.—The Colorado promoters of the Santa Fe Electric Railway are figuring on the building of an electric railway line to the Cochiti. A prospectus of the resources of that district is being prepared with that purpose in view.

Sedalia, Mo.—A Sedalia capitalist proposes to build an electric road east and west out of Nevada.

Toledo, O.—This city will soon be connected with Chicago by an electric railroad. Michigan and Indiana capitalists have incorporated a company for that purpose to be known as the Chicago & Toledo Railway Company. They will build a line through the counties of Newton, Jasper, Pulaski, Fulton, Kosciusko, Whitney and Noble. J. A. Hamilton of White Cloud, Mich., is at the head of the company.

Westfield, N. J.—W. G. Peckham is interested in the proposed trolley road between this place and Springfield.

Company Matters.

Chicago, Ill.—The Leecoll Storage Battery Company's number of directors has been changed from four to five.

Milwaukee, Wis.—Walter Cary recently said that the Milwaukee Electric Company, of which he is vice-president, expects to build a $40,000 factory as soon as a suitable location could be found.

Warren, O.—The Warren Electric & Specialty Company recently voted to increase its capital stock from $100,000 to $200,000.

Manufacturing.

Birmingham, Ala.—The Boykin-Bullock-McCall-McDonnell Electric Company has recently been organized with a capital of $40,000 for the purpose of manufacturing and dealing in electrical supplies. F. M. Boykin, E. W. Bullock, E. L. McCall, I. F. McDonnell and H. H. Peevey are at the head of the firm.

New York City.—The Hungerford Electric & Manufacturing Company has been formed lately to do a general electric and manufacturing business. Among those interested are: J. S. Honeycombe, A. W. Rose, P. Dwight, E. B. Merrill, S. D. Maynard, all of New York City. The capital of the concern is $1,500,000.

Oriental, N. C.—P. J. Delamon of this place wants correspondence with manufacturers of electrical machinery, etc.

Power and Transmission.

Ashland, Pa.—Plans for the building of a new power plant are being considered by the Schuylkill Traction Company.

Carthage, N. Y.—P. J. Corcoran and John E. Strickland have purchased two water powers on Beaver River capable of developing 2,500 horse power. Already work has begun toward developing these powers, and by another year Beaver River will be lighting this city.

Chattanooga, Tenn.—The Rapid Transit Company will treble the capacity of its electric power plant.

Fruitvale, Cal.—The Fruitvale Light, Power & Heat Company has been formed for the purpose of manufacturing and transmitting gas and electricity for lighting and heating purposes. The capital stock of the corporation is fixed at $100,000, of which J. C. Hammell, A. N. Frost, Charles H. Fehnemann, J. H. W. Riley, P. H. Blake, B. Fehnemann, L. Battles and Amy G. G. Fehnemann are the stockholders.

Automobiles.

New York City.—The C. J. Downing & Co. was lately organized here by C. J. Downing, V. B. Rice and Carrie M. Downing, for the purpose of dealing in bicycles and automobiles, with a capital stock of $5,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Nov 19						
United Traction	100	$5,000,000	$5 000 000	1¼ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Nov 1						
Allentown & Lehigh Val. Trac. Co		4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Nov 19:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Nov 19						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—ov 19.						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	98	98½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	114
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156½	157
Brooklyn N. Y.—Nov 19:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	229	231
Brooklyn Rap. Transit Co., tr certif.	100	48,000,000	48,000,000	....	84	84⅛
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Nov 19:						
Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., 99.	99	100
Columbus O.—Nov 19						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	87	90
Charleston, S. C.—Nov 19						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Nov 19						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	250	252
Chicago & South Side R. T. RR	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	.....	9¼	10
Metropolitan West Side Elev. Ry	100	15,000,000	7,000,000	Feb 28 1900.	31	32½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	75	76¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	190	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99	103
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	99	100
Union Traction Ry............com	....	1,250,000	624,900	35 %	12½	13½
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	46¼	47
Cincinnati, Ohio.—Nov 19.						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1½ % Q., Jan.	126½	127
Cleveland, Ohio.—Nov 19.						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102½
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Nov 19:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Nov 19.						
City Railway Co...............com.	100	1,500,000	1,470,600	1½ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	...	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Nov 19						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Nov 19						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Nov 19.						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %,	150	-
Indianapolis, Ind—Nov 19.						
**Indianapolis Street Ry	...	5,000,000	5,000,000	....	15	18
Lancaster, Pa.—Nov 19						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Nov 19:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	81½	82
Louisville Ry...................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	100	111
Minneapolis, Minn.—Nov 19						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	68⅝	68⅞
Twin City Rapid Transit....7 % pfd	....	3,000,000	1,712,200	1¾ %, Oct.	186	187
Montreal, Canada.—Nov 13						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	276½	277
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1¾ % S., J. & J. †	108½	108¾
Memphis Tenn.—Nov 19:						
Memphis Street Railway Co	100	500,000	500,000	....	25	-
New Haven, Conn.—Nov 1:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	--
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Nov 19						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Nov 19:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	120	125
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	174	174⅛
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	195	205
k Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	195	200
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	112	112⅛
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Nov 19:						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	....	59½	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	23	23½
United Elec. Co. of New Jersey	100	504,000	504,000	11¾ % A.	16	19
Pittsburg, Pa.—Nov 19:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	23	23½
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	62	68
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	78
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72½	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	. ½	--
Federal St. & Pleasant Valley Ry	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000		5 % A., June	..	..
United Traction Co.............com.	50	17,000,000		J. & J.	15	15½
United Traction Co.............pref.	50	3,000,000		J. & J.	50½	51

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Nov 19						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Nov 19						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Nov 19.						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Nov 19						
Paterson Ry. Co	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Nov 19						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Nov 19						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	300,000	300,000	3 % Feb. 1, '99.	75	76
Union Traction Co.......... $12½ pd	50	30,000,000	29,930,450	....	36⅞	37
c Electric Traction Co	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90⅛
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
c People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
*j*Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Nov 19						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Nov 19						
j Reading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	850,000	350,000	Jan., '98.	138	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis, Mo.—Nov 19						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	..	--
United Electric Ry...........com.	50	500,000	500,000	....	20	21
United Electric Ry.......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	83	84
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	375,000	$2.50 share, '96.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Nov 19						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16⅛	...
m Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Nov 19						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Nov 19						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Nov 19						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Nov 19						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	§ 108¼	108½
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	276¾	277
Washington, D. C.—Nov 19						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	29	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Nov 19						
*Worcester Traction Co........com.	100	3,000,000	3,000,000	....	31	32½
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Nov 19						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 19						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	156	156½
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	104	105
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	123⅝	124
New York.—Nov 19						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	102	106
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		2	2¼
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	85⅛	85⅝
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Nov 19						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	....	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	3¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 19						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	36	48
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug.. 1898.	..	-
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	170	170⅛
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	44	46
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	62	63
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Nov 19						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co...........com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	170	170⅛
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Nov 19						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Nov 19						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	89	92
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	89	94
Northern Elec. Light & Power Co.	10	550,000	550,000	......	13	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Nov 19						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	159	160
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	--
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	91¾	92
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120
Royal Elec. Co. (Montreal)	..	1,000,000	......	2% Q	‡ 208	204¼
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	136¾	137
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Nov 19.						
American Electric Heating Co	50	10,000,000	....	.....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$8.50 p.sh.	--	100
New York.—Nov 19						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Nov 19						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	2⅜	2¾
United Gas Improvement Co..scrip.	50	10,000,000	......	---	--	162
Welsbach Commercial Co.....com.	100	3,500,000	......	---	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada.	5	500,000	......	....	1	1¼
Pittsburg, Pa.—Nov 19.						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Nov 19						
*Barney & Smith Car Co.......com.	100	......	1,000,000	---	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......		82	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	54	55
Johns-Pratt Co	100	......	......	---	105	109
*Pratt & Whitney Co...........com.	100	......	......	---	2	4
*Pratt & Whitney Co............pfd	100	......	......	---	40	50
Stillwell-Bierce Co.............com.	--	......	....	---	--	50
Stillwell-Bierce Co.............pfd.	--	......	......	2 % Sept 1,'99.	50	65
Shultz Belting Co	100	500,000	......	....	80	90
St. Charles Car Co		......	......	......	99	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Nov 19, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117⅛	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
†Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	....
‡Watervliet Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‡Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation- Nov19, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR.......1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¾
†Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
†Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T...............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‡W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 ds. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‡Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	182¾	187

†Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation- Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114⅛
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5	100,000	24,000	1912	M & S	......	....

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	$150,000§	1912	*M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	......	50,000	1899	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1943	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	10[illegible]
Broadway & 7th Ave.........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface..............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface..............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98⅛	100⅛
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	850,000	850,000	1919	......	110⅛	11[illegible]
Third Avenue RR.............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	12[illegible]
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Nov 19, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Nov 19 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry......................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry.....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry................1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co.................Col. tr. 4s.	29,785,000	29,724,876	1945	A. & O.	....	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Nov 19 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	375,000	375,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1913	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1923	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,039,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	....

Providence R. I.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Nov 19, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101⅛	10[illegible]
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101⅛	10[illegible]
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter—1st	1 000 000	000 000	191	J& [illegible]	17	

*With interest. §Unlisted.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis. *Date of Quotation*— Nov 19, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co..........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co........................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co.................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99¼	100¼
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	101	100¼
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal. *Date of Quotation*— Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126¼	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126¼	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105¼	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co....... ......1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Washington D.C. *Date of Quotation*— Nov 19, 1900						
Belt Ry. Co......................Cons. mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry............................ mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*— Nov 19, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1938	J. & D.	115	115⅞
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.). Cons. mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105¼	106
St. Paul City Ry......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens
††$620,000 in escrow.

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass. *Date of Quotation*—Nov 19 1900						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa *Date of Quotation*– Nov 19, 1900						
Allegheny County Light Co.............. 6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Nov 19. 1900)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s	8,000,000	....	......	F. & A.	102⅞	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*– Nov 19 1900.					100½	101
American Bell Telephone................... 4s.			1908	F. & A.	......	...
Northwestern Telegraph Co................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous. *Date of Quotation*—Nov 19, 1900						
American Electric Heating.............7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co...............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

*Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The annual meeting of the Metropolitan Street Railway Company will be held in this city December 3.

It is reported from Worcester, Mass., that a consolidation of all the street railways centering there has been effected.

The Kings County (N.Y.) Electric Light and Power Company will issue on November 21, $520,000 new stock at par, making the total $2,500,000.

A strike of the employes of the Southwestern Telegraph and Telephone Company, part of the Bell system, is said so be spreading through Texas and Arkansas.

The regular quarterly dividend (No. 22) will be paid on the common capital stock of the American Graphophone Company on December 15 to stockholders of record December 1.

Advices from Allentown, Pa., state that the Lehigh Valley Traction Company has bought the Allentown and Slatington trolley lines, 21 miles long, and the Slate Belt Line, 17 miles long.

The gross earnings of the Cleveland Electric Railway for the month of October were $185,000. The gross receipts are $34,200 in excess of October, 1898, and $45,000 in excess of October, 1899.

A dispatch from Chester, Pa., states that the Philadelphia & Delaware Railway and the Prospect Street Railway companies have consolidated under the name of the Philadelphia and Chester Railway Company.

The Buffalo and Niagara Falls Electric Light and Power Company will hold a meeting on November 26 at the office of the company in Buffalo for the purpose of voting on the proposition to increase the capital stock of the concern from $200,000 to $500,000.

President Charles J. Glidden, of the Erie Telephone system says that there is not a word of truth in the dispatch sent out from Baltimore that the Erie Company had purchased the independent telephone properties at Baltimore, Pittsburgh, and at other points.

The annual report of the Ballston (N. Y.) Terminal Railroad Company for the year ended June 30 last shows the gross earnings to be $14,243; operating expenses $13,650; net earnings, $537. The report of the road for the September quarter shows gross earnings, $5,328; operating expenses, $5,230, net earnings, $98.

The Western Electric Company has executed a trust deed to the Chicago Title and Trust Company upon 225,000 square feet of land at West Polk street, Chicago, and the river, to secure a bond issue of $500,000, payable in five years, and bearing 4½ per cent. interest. The interest is payable at the Bank of New York, the National Banking Association of New York.

The Edison Electric Illuminating Company of Boston has filed with the commissioner of corporations the following certificate of condition of September 30, 1900. Assets: Land and water power, $309,358; buildings, $881,214; machinery, $1,856,083; debts receivable, $356,341; stock in process, $90,765; miscellaneous, $2,108,532; total, $5,602,293; Liabilities: capital stock, $4,310,500; debts, $369,950; balance profit and loss, $446,343; reserve for depreciation, 475,500; total, $5,602,293.

United States production of copper (long tons) for October, 1900, aggregated 23,345 tons compared with 21,086 tons for the previous month and 23,980 tons, October, 1899. For ten months, 223,387 tons compared with 215,201 for the corresponding period in 1899, 195,940 tons in 1898, 176,398 tons in 1897 and 169,910 tons in 1896. Exports of copper from the United States (long tons) for October, 1900, aggregated 12,682 tons compared with 10,425 the previous month, and 11,360 tons October, 1899. For ten months, 138,881 tons compared with 93,453 tons the corresponding period in 1899, 117,152 tons in 1898, 109,334 tons in 1897 and 100,591 tons in 1896.

The Boston "News Bureau," says: "The statement of the General Electric Company for the seven months ended August 31 shows net earnings after all expenses, interest charges and preferred stock dividends, of $3,219,978, which is equivalent to 17½ per cent. on $18,276,000 common stock then outstanding. The sales of the company for these seven months amounted to $14,803,383, confirming our previous statements to the effect that the company was doing a gross business of $2,000,000 a month. The sales for the fiscal year ended January 31, 1900, amounted to $22,379,463. The manufacturing profit for the seven months was about 20 per cent., which, added to the income from the company's investments, should bring the earnings of the current year to an amount equivalent to between 30 per cent. and 35 per cent. on the common stock. Earnings last year showed 27 per cent."

The General Carriage Company announces that it has just completed a traffic arrangement with the Westcott Express Company by which its cabs are hereafter to serve the Grand Central Depot and elsewhere in this city where Westcott express cabs are stationed. The Carriage Company reports that it is steadily increasing the number of its cabs and the efficiency of service. In the past three months it has installed a service in connection with the Baltimore and Ohio Railroad and is now running a complete line of cabs of various patterns. It is officially stated that the earnings of the company are demonstrating that the public will patronize liberally a cheap but well conducted cab service.

A director of the General Electric Company is quoted as follows: "It is determined by the management to continue the process of drastic 'writing off' adopted in previous years, but that, notwithstanding this, the chances are that the profit and loss surplus at the end of the year will stand somewhere near $6,000,000, against about $2,400,000 on January last. It must be remembered that this is in every sense an actual surplus, being represented by cash assets in working capital. By the replacement of debentures with five-sixths of their par value in common stock, the company creates an additional surplus of some hundreds of thousands of dollars by writing down its capital stock that amount. It will then have no debts, and working capital for every dollar of its capital stock, to say nothing of an earning capacity of about 30 per cent. on the stock."

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ELECTRICITY.

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

The Unwholesomeness of New York's Water.

About this time every year numerous complaints reach the Health Department in this city, regarding the color and taste of the water furnished the inhabitants by the authorities. Last year the matter received considerable attention at the hands of the Board of Health and the daily papers, and although Dr. Charles F. Roberts, sanitary superintendent of the Health Department, recommended that a system of filtration be adopted, nothing was done other than to blow off dead ends and hydrants throughout the boroughs of Manhattan and Bronx.

This important matter which affects the well being of some 2,000,000 people has again only recently, been brought to the attention of the authorities through the condition of the water, which is even worse than it has been at any time previous. Dr. Roberts in an interview refers to the condition of the supply as follows:

"From October until the middle of December the water has been turbid for years, and it will continue to be so until the city puts in a filtering plant. Croton Lake has been a receiving basin for more than half a century. Its bottom is covered with a thick deposit, derived partly from organic and partly from inorganic sources. Portions of this deposit are carried by the water and distributed through the mains of the city.

"However offensive and disagreeable the water may be, there is no typhoid in it. This is shown by the analysis, and by the fact that no increase in the number of typhoid cases has been reported.

"What effect the impure water has upon stomach and intestinal troubles and upon the mortality among children is another matter. Diarrhœa, gastritis and entritis are caused and intensified by the use of water of this character.

"I have recommended that a system of filtering the entire supply of the city be established. Other large cities filter their water, and their statistics show a lower death rate and reduced number of typhoid cases. London uses a sand filtration system. We would probably obtain better results, at less cost, if a mechanical filter were used, as it requires less space."

Last year Dr. Roberts made practically the same recommendation. and as was to have been expected no action was taken by the city authorities, owing to the expense such a filtration plant would involve. At that time we called attention in these columns to a method of purifying water in use at Saint Maur near Paris, France, which might possibly be adopted to advantage in connection with the Croton supply. This system, which consisted in passing air that has been subjected to the action of a high-tension electric current through the body of water to be purified, is comparatively inexpensive and yet accomplishes most thoroughly the object intended, namely, sterilization.

According to statistics the cost of purifying a cubic yard of water by this method is .028 cent. With this figure as a basis and assuming the amount of water consumed daily in the boroughs of Manhattan and Bronx, amounts to about 250,000,000 gallons (which it does), the daily expense to the city for purifying this body of water would be in round numbers $335. In a year this would amount to $122,275, which is certainly little enough to pay for good, wholesome water, especially when it is recalled that the annual cost of maintenance of the Water Supply Department of this city amounts to over $1,500,000.

It might be well for the authorities to examinine into this French system of water purification, especially in view of the fact that some 20,000,000 gallons of the water which is consumed in Paris is daily treated by this process.

* * *

Preliminary Trial of Electricity on the Elevated Roads.

After a patient wait of several years, it would seem as though the non complaining citizens of New York City would shortly be able to journey from their offices to their residences uptown without the waste of an enormous amount of time, and last but not least in comparative comfort. The long-promised third-rail system for the elevated roads is beginning to materialize, a stretch of track along Second avenue from Sixty-fifth to Ninety-fourth street having been equipped with this method of propulsion.

With a view to testing the working of the apparatus an experimental train was run over the new section on November 22 and attracted no little attention. The train consisted of two motor cars and four trailers, the former being

located one at each end of the train. Everything was new and up-to-date. The cars are the same length as those now in use, though broader and raised more from the tracks. They weigh about 16 tons apiece. The motor cars, which are provided with four 150 horse-power electric motors each, rest on heavy steel frames and weigh about 35 tons. The current is taken from the third-rail by means of iron contact shoes in the ordinary manner. One commendable feature to be noticed on the section just completed is that the third-rail is encased between planks set on edge to prevent any one coming in contact with the live rail.

A feature of this system is that the operating mechanism is controlled from the cab in the front motor car. The method is very similar to the ordinary system of hand control, but much simpler than anything hitherto tried. The locomotives would seem a combination of those used on the Baltimore & Ohio road and those on the London Underground.

In the trial runs last week the train consisting, as already stated, of six cars, obtained an average speed of about 34 miles an hour. Referring to the change of motive power, Mr. Hugh Hazleton, assistant electrical engineer of the road, is reported as saying:

"The change from steam to electricity will be made gradually. Work on the power station at Seventy-fourth and Seventy-fifth streets and East River is under way, and we expect that it and the seven sub-stations along the line, from which the current will be distributed to the rails, will be completed in three months.

"Owing to an electrically driven air compressor and the air brake apparatus, the stops and starts are smoothly executed. The electric trains will be first introduced on the Second avenue line. We expect to gain at least ten minutes in running trains from the Battery to 155th street on the Sixth avenue line. With this system of propulsion we obtain four times the horse power provided by the ordinary steam engine."

The general adoption of electricity on the elevated roads will much decrease the time of travel between the Battery and Harlem. As stated above a speed of thirty-four miles an hour could be attained instead of eleven or twelve as at present. In view of this fact it is to be hoped that the Manhattan Elevated Railway Company will make every effort to complete the change as soon as possible.

* * *

The Mica Production of this Country.

The report of the United States Geological Survey, covering the mineral resources of this country for the calendar year of 1899, shows, among interesting data, that the mica production in 1899 consisted of 108,570 pounds of sheet mica valued at $70,587 as compared with 129,520 pounds valued at $103,534 in 1898; in addition to this there was a production of 1,505 short tons of scrap mica, worth $30,878 as against 3,999 short tons at $27,-564 in 1898. These figures show two things: first, in both production and value of sheet mica during 1899 as compared with 1898 of 20,950 pounds, and $32,947 respectively; second, a decrease in the quantity of scrap mica of 2,494 short tons, or of over 60 per cent., with an increase in value of $3,314, or 12 per cent.

The decrease in domestic production is ascribed in large measure to the very large importations of foreign mica during the past year. This may reasonably be supposed to be the case, if we compare the importations for the last five years, ending June 30 of each year, as follows: 1895, 820,982 pounds, $127,515; 1896, 1,264,066 pounds, $214,991; 1897, 881,510 pounds, $187,845; 1898, 625,083 pounds, $94,294; 1899, 259,228 pounds, $1,616,397.

Taking the report for the calendar year of 1899 it is seen that the total importation of mica manufactured was 1,709,839 pounds, which was nearly double that of the year preceding and the total value was greater than any ever before recorded.

The reason for the increased demand for mica is easily to be found in the development of the use of electricity during the past few years, which has created a demand for mica as an insulating material, and much of the small-sized mica, which was formerly of little value, if not altogether unsalable, now finds a market among electrical manufacturers. Part of this is reported with the sheet mica product, and as it sells for much less than the larger sizes, which are used in the manufacture of heating stoves, lamp chimneys, etc., it has the effect of making an apparent decline in values. On the other hand, part of the small-sized sheet mica used for electrical purposes is reported as scrap, and in this case causes an augmented value. As an instance, in 1896 the value of scrap mica produced and reported as such was only $1,750; in 1897 it had increased to $14,452; in 1898, $27,-564, and as already stated, to $30,878 in 1899.

From the year 1880 up to and including the year 1892 the returns covering the production of scrap and sheet mica in the United States were not reported separate.

When the Dingley bill was enacted it carried in it a provision whereby mica has two specific classifications and rates of duty, one as "unmanufactured," dutiable at six cents per pound and twenty per centum ad valorem, the other as "cut or trimmed," at twelve cents per pound and twenty per centum ad valorem: and the imports for those years as specified, show that, in 1897, and prior to the enactment of the law on July 24, the quantity of both classes combined was 656,118 pounds at $140,353; after that date, unmanufactured, 66,821 pounds at $10,-981 and cut or trimmed 226,771 pounds at $41,068. In 1898 the quantity of unmanufactured was 877,930 pounds at $115,930, and of cut or trimmed, 78,567 pounds at $34,152; and in 1899, 1,709,839 pounds unmanufactured at $233,-446, and 67,293 pounds at $42,538 of cut or trimmed. It will thus be seen that the importation is rapidly on the increase.

ONE of the advantages derived from the use of Marconi telegraphic outfits on boats crossing the English Channel is that notice can be given to connecting railways regarding the number of passengers for whom accommodations are required. In such instances the proper information is transmitted to the port at which the steamer is about to arrive. But a Belgian vessel demonstrated another interesting possibility the other day. She left Ostend for Dover in an exceptionally heavy gale, although she carried a number of Government officials desirous of witnessing a test of the system. The two ports are over seventy miles apart. Yet until within a few miles of Dover the steamer continued to report back to Ostend her progress and safety, besides dispatching numerous complimentary messages. In case a boat should be disabled, it would be even more desirable to maintain communication with her owners than if unharmed. The line to which this particular vessel belongs will now equip its whole fleet with Marconi apparatus.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE 148th meeting of the American Institute of Electrical Engineers was held at 12 West 31st street, New York, on the evening of November 23. A paper was presented by Mr. B. A. Behrend on "The Mechanical Forces in Dynamos Caused by Magnetic Attraction." The plant of the St. Croix Power Company of Wisconsin was also ably dealt with in a paper by Mr. Henry Floy.

THE Rensselaer Polytechnic Institute at Troy, N. Y., which is about to give special and thorough courses in electrical engineering, is having fitted up a new electrical laboratory. The dynamos, transformers and other electrical apparatus have already arrived. Large sums for equipping this laboratory have been donated by local alumni.

THE first electric cars ever operated in Honolulu began running to Pacific Heights on November 12. Work on electric lines throughout the city has begun.

THE question is being agitated at Austin, Tex., for an electric fire alarm system for that city. The telephone is used at present, but at times it causes a delay, and is not as quick as an electrical service. It is said that one of the aldermen will introduce an ordinance at the next meeting of the council providing for a first class electric fire alarm.

THE Havana Electric Railway Company will have its new line and the reconstruction of the old completed by March next. All the important contracts have been let.

ADVICES from London state that the General Post Office is said to have taken over the Marconi system of wireless telegraphy. If this should prove so nobody but the Government will have the legal right to operate that method. The statement is not confirmed yet, but an expert commisson of the Postal Department is preparing a report on the question of its adoption. Whether this will result in a revolution in telegraphy there, or is merely a Governmental safeguard, remains to be seen.

THE new escalator of the Manhattan Elevated Railway, at the corner of Sixth avenue and Twenty-third street in this city, was put into operation November 23. The cost of the plant is estimated at about $15,000. The stairway will carry more than a hundred people at a time.

THE Cahill electrical typewriter is the invention of a Washington, D. C., man, Dr. Thaddeus Cahill, who has applied electricity to impel the mechanism. A magnet is placed in the machine to impel the type bars, space mechanism and all other moving parts, and the finger of the operator merely designates which letter shall be printed, touches it lightly, the circuit closes and electricity performs the work. No matter how hard a key may be struck the impression is always uniform. The

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machine is also equipped with a rheostat, by means of which a stronger current may be secured for manifolding.

A NUMBER of motors will probably be placed in use by the New York Central Railway shortly, as an experiment in the Park avenue tunnel in this city. President Callaway is much interested in the matter, and it is due to the agitation against the nuisance of steam engines running through the tunnel to the great annoyance of residents along the line that the change is being made.

THE Onondaga Dynamo Company and the Straight Mine Company of Syracuse, N. Y., will have electrical exhibits at the Pan-American Exposition. The two companies will unite in operating the generators, dynamos and other machinery necessary for the running of the electrical display in the court of the Machinery Building and in the illumination of the fountain.

A PLAN is well under way to establish in Yonkers, N. Y., a new department to be known as a Bureau of Electricity. Already sub-committees have been appointed by the police and fire boards looking toward an improvement which, it is asserted, has been found to be an urgent necessity.

FROM Paris comes the statement that one of the most frequent uses to which the telephone is put by French country subscribers is that of an alarm to wake them in the morning. Those who wish to be aroused at a given hour have only to advise the telephone administration the night before of the hour at which they wish to arise.

THE Penn Gas Coal Company at Greensburg, Pa., took out its first coal a short time ago at its Penn mines under the new electric haulage system. A powerful electric motor takes the place of the old engine formerly employed to bring the coal from the mines.

NINE Chinamen, living in Mott and Pell streets of this city, were arrested last week on the complaint of the Edison Electric Illuminating Company. They were charged with tampering with the electric meters in their stores so that they would not register the amount of electricity used.

A CORRESPONDENT signing himself "South Africa" writes to the London "Times" as follows: "I can give you another illustration of the way in which the indifference of the British manufacturer drives trade into foreign hands. I recently applied to a maker in London for quotation for some thousands of wood boxes, specifying the size, and the nature and weight of the contents they were to carry. The British manufacturer asked for particulars as to the thickness of the wood and declined to quote without this information. While obtaining the necessary details from abroad, I at the same time sent the inquiry to America, and received a reply by return mail, quoting prices for boxes and estimated strength to carry the contents specified, although stating that the thickness should have been given. The result is that America will probably get the order. I see the two rivals sitting side by side at a dinner table. The Yankee at once 'goes for' the repast and satisfies his needs. The Britisher finds himself short of a knife or a spoon, calls for the missing article and will not commence his meal until he gets it, and when at last it comes the dinner is all consumed. Surely the British manufacturer must be losing his appetite for trade."

THE Nickle Copper Company of Ontario has recently been experimenting with a new process of nickle and copper extraction. The process is the invention of Mr. H. A. Frasch, and it is said to be very successful. As applied to the Sudbury copper-nickle matte, the process consists, says the "Engineering and Mining Journal," in the electrolysis of a brine solution in such a manner that, while the sodium ions are set free at the cathodes with the formation there of caustic soda, the chlorine ions are liberated in the anode section containing the matte and immediately form a chloride solution of the metals present.

A NEW method for hardening and increasing the life of storage battery plates has just been patented. It consists in dipping the plates alternately in acidulated water and a dilute solution of pyridin, which is a complex chemical substance derived synthetically from coal-tar residues. In the pyridin solution is a small quantity of alcohol, and it is asserted that the combination of all the agencies concerned results in greatly strengthening the plate mechanically and also by highly oxidizing the plate, in making it of considerably higher capacity than it would be without this treatment.

HEAVY cars, each holding sixty passengers, traveled easily thirty-seven miles in one hour over the Albany and Hudson Electric Railway at the formal opening on November 22. The run was from Hudson to Rensselaer and return. The distance between those two places is thirty-seven miles. Power is obtained from the Stuyvesant Falls for running the trains and will also be used for lighting towns and villages along the line and for furnishing power. The power part of the plant has been in successful operation, and the current already is used in lighting the towns of Hudson and Rensselaer. The road runs through a hilly country, but the cars mount the grades without apparent trouble. It is generally believed that this is the beginning of an electric line eventually to extend from Albany to New York.

A LARGE number of supporters for cables have been devised, the conditions necessary to be fulfilled by a successful appliance of this sort being so difficult that great trouble has been encountered in finding one that would meet them. At one time tarred ratline, or small hemp yarn, was used, the yarn being spun from a contrivance made for the purpose about the support wire and the cable so that the latter hung in a great number of loops of the soft yarn from the former. The difficulty with this method was that in the course of time the ratline would naturally rot and allow the cable to fall. Metallic slings of various kinds have been made, and while some of them have been successful, most of them either grip the cable so tightly as to weaken or injure it, or else hold it so loosely as to let it slip down hill on inclined lines or toward the lowest point of the sag between poles. A new type of cable-clip grasps the cable by means of a soft metal band encircling it and tightened by the weight of the cable itself, much in the same way as the buckle of a patent shawl strap is worked.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 3.

THE ELECTRICAL MEASUREMENTS.

We employ electricity in a thousand different ways and for a thousand different purposes. It has become a commercial necessity. We buy and sell it, light our homes, run cars, transmit messages, supply power for mills, in fact use it in innumerable ways, and to do this we must be able to measure it so that we can employ its services, buy or sell it with some degree of accuracy. Although electricity has an existence, yet we cannot weigh it for it has no weight, neither can we measure it by quarts or gallons, for it does not occupy space, nor yet by sound, for it cannot be heard, nor by a rule, for it has not form, but we can measure it by its power of doing work. Now understand this clearly. Suppose we have a certain amount of work to perform. We know we can do it by electrical energy and that to do double that amount of work it will just take double the amount of electrical energy, so we base our measurements on what it will accomplish and deduce a rule that is just as accurate electrically as that we know that two and two make four and that twice two can never make anything but four.

The three measurements in electricity which are the most important are: The volt, the ampere and the ohm.

We will explain these three terms in the order given and endeavor to compare them with something or some laws with which we are all familiar so that they may be the better understood.

The volt is the practical unit of measurement of electrical pressure or force.

In the boiler of a steam engine the steam has a certain force registered by the steam gauge which indicates the pounds pressure per square inch. Now if there be a pipe attached to the boiler and the steam is allowed to escape it will be forced out by the pressure in the boiler, and if some obstacle be placed in the way it will be forced to one side because the energy will be exerted upon it. Just so in electricity, we have a force or pressure of the current dependent upon its source and this pressure we call voltage, and we can measure it in volts or force units because it has the power of doing work just as steam has when it is under pressure and has force.

Take as another illustration: Suppose there be a reservoir of water on a high elevation and discharge pipes connected to it; the force or pressure of water at the point of discharge will be dependent upon the weight of water above that point, or in other words, the elevation of the reservoir above the point of discharge can be registered by pounds per square inch. Of course it makes no difference whether the discharge pipe be large or small, the pressure of water will be the same, that is, the pressure of water at the discharge point will not depend upon the size of the pipe or the amount of water it contains, but, as we said before, depends entirely upon the elevation of the water in the reservoir. Now just so in electricity,

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do not conflict the amount of current with the pressure, for the voltage is not dependent upon the amount of current but upon the force or pressure of it. As pounds per square inch indicate the pressure of the water in the pipe regardless of the amount it contains so voltage in electricity represents the force or pressure of the electricity regardless of the amount of current or flow.

The ampere is the practical unit of measurement of the rate of flow of electricity.

Take again our example of the reservoir. If the discharge pipe be one inch in diameter and is opened to the free flow of water the rate of discharge would be calculated by gallons per minute. Now suppose that the pipe be two inches in diameter, then the rate of flow would be a great deal more. The water is forced through the pipe by the pressure, but it is discharging at a certain rate dependent upon the size of the pipe and the pressure, so we now have another measurement to take into consideration, which is the quantity of water discharging, or, in other words, the rate of flow. Just as the pressure forces the water to flow at a certain rate and the rate is measured by gallons per minute, so in electricity the voltage forces the current to flow at a certain rate, and that rate is measured by amperes of which one ampere is the unit.

The ohm: Again resorting to our example of the reservoir of water, you know that much more water flows through the two-inch pipe than there will through the one-inch pipe, and why? Because there is less resistance to the flow. So you see there is something that prevents all the water flowing away at once, and that is, it is not permitted to do so on account of the size of the pipe, which is the resistance offered to it. So we come to another condition that we must take into consideration, and that is the resistance offered to its rate of flow. In electricity we have a corresponding measurement to be considered, and that is the resistance offered to the flow of current. This is measured in ohms of which one ohm is the unit.

In our example of the reservoir we measured the pressure by pounds per square inch, the rate of flow by gallons per minute and the resistance to that rate of flow calculated by the diameter or size of pipe which is used to discharge, also we have our three measurements in electricity—the pressure or force measured by volts, the rate of flow by amperes, and the resistance to the rate of flow by ohms. As you know water has substance and weight and therefore occupies space, but electricity has neither substance nor weight and does not occupy any space, consequently we must now drop our comparison which we used for the sake of explanation and apply the electrical measurements.

One volt is that amount of electrical pressure or force which will cause one ampere of current to flow over the resistance of one ohm.

One ampere is the amount of current that will flow over the resistance of one ohm when forced by the pressure of one volt.

One ohm is the amount of resistance that will permit the flow of only one ampere when forced by the pressure of one volt.

When water is forced through a pipe under pressure from a reservoir or other source, the stream of water which flows is proportional to the pressure divided by the resistance which the pipe presents to the flow of the water. In just the same way when a current flows through a wire under the pressure from a dynamo or other source of electricity, the current which flows is equal to the pressure or force divided by the resistance of the circuit. This relation between the three measurements, pressure, current and resistance, is called Ohm's Law and is often written $C = \frac{E}{R}$, where C stands for current, E for pressure and R for resistance.

Take as a demonstration of this so that it may be more clearly understood: 1 volt will force 1 ampere over the resistance of 1 ohm, then 8 volts would force 8 amperes over the resistance of 1 ohm, but 8 volts would only force 4 amperes over the resistance of 2 ohms; 8 then is the number of volts of electrical pressure required to force 4 amperes of current over the resistance of 2 ohms. Now

$4 = 8 \div 2$ and $8 = 4 \times 2$ and $2 = 8 \div 4$.
8 represents the pressure or force,
4 represents the current, and
2 represents the resistance.

To find the voltage in a circuit multiply the current by the resistance.

To find the current flowing in a circuit divide the pressure by the resistance.

To find the resistance of a circuit divide the pressure or voltage by the current.

Wherever you have two of the measurements of Ohm's Law known you can easily find the third, for $C = E \div R$, $E = R \times C$, $R = E \div C$.

The electrical power of doing work is measured by watts, of which one watt is the unit. One watt is the amount of work accomplished by one ampere of current when forced by the pressure of one volt.

One volt and one ampere will do one watt of work. Two volts and one ampere would do two watts of work. Two volts and two amperes would do four watts of work, etc.

So to find the watts multiply the volts by the amperes; 746 watts is equivalent to a horse power, which is that amount of energy required to lift 33,000 pounds one foot in one minute. Now to find the horse-power of an electric current, multiply the volts by the amperes and divide by 746.

SOME EXAMPLES TO WORK.

Find the resistance of a circuit over which 10 amperes are flowing at a pressure of 50 volts?

Find the voltage required to force 5 amperes of current over a resistance of 20 ohms?

Find the amperes flowing in a circuit of 20 ohms resistance with a pressure of 100 volts?

Find the watt capacity of an electrical machine which is capable of producing 500 amperes at a pressure of 110 volts? What would be the theoretical horse-power required to operate this machine when carrying full load? The answers to these examples will appear in the next issue.

Article No. 4 will be entitled Primary Batteries (current produced by chemical action).

Setting Diamonds by Electricity.

George Anderson, a Scotchman, has recently patented in this country a method of setting diamonds or other precious stones by electricity. A hole is first drilled nearly through the metal in which the stone is to be set: the latter is placed in this hole; the metal is brought to a welding heat by electricity, and the hole behind the stone is closed. The latter is now completely surrounded by a mass of the metal setting. The latter is then ground away so as to expose the stone, any desired form of setting being readily obtained.

THE PARIS EXPOSITION OF 1900.*

BY CARL HERING,
President of the American Institute of Electrical Engineers.

A large international exhibition, like the one about to close, may be judged from two standpoints. For commercial reasons a necessary feature is its general attractiveness, that is, its beauty, architecturally as well as in the arrangement of the grounds and in the decorations, its proper combination of instruction and entertainment, and its purely entertaining features. On the other hand such an exhibition should be a representation of what is called the state of the art in the various industries, and to a certain extent at least, show the relative importance of competing industries.

From the first of these standpoints this exhibition may be said to have been a great success. It certainly was very beautiful and attractive, and in this respect it was typically French, for to the Frenchman such an exhibition would be a failure if it were not beautiful. While there were undoubtedly a few architectural features that might be criticised unfavorably, yet in general the buildings and arrangement of the grounds left little to be desired, although the absence of straight lines in the architectural decorations of the main buildings might not meet with the approval of every American, for in this respect they differed typically from those in the Chicago exhibition. The arrangements and decorations of the characteristically unsightly interiors of long exhibition buildings, were also very tasteful and effective; although the avoidance of a regular system of aisles made a systematic study of the exhibition an almost hopeless task. In some of the attractions, such as the Optical Palace, the underground mines, etc., instruction and entertainment were combined, but as a rule the too numerous "side shows" were for amusement only, and were typically French.

From the other standpoint, that of showing the state of the arts, the exhibition may have been, and undoubtedly was, a success in many departments, but that claim can hardly be made for the electrical industry. For France, Germany, Switzerland and a number of the other continental countries the electrical exhibits doubtless represented the true state of the art and the best general practice as far as these countries were concerned; but the absence of a proper representation from the United States proportionate to the enormous development, made the exhibition an incomplete representation of the present state of this important industry. Any one judging its development in the respective countries by their exhibits, would have obtained a very wrong impression of its progress in the United States, or of the general practice here. We sent over a few excellent electrical exhibits, and they were greatly admired, but there was general disappointment that a country in which the electrical industry is known to be so largely developed, was so inadequately represented. This is all the more unfortunate at the present time when our export trade of manufactured articles is growing so rapidly, and when our electrical practice, in certain directions at least, is thought so well of by foreigners that many of them come over here to study it.

The fact that several of our largest manu-

* Abstract of inaugural address at the 147th meeting of the American Institute of Electrical Engineers, New York, October 24, 1900.

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facturers have ceded their rights in foreign countries to local companies and therefore claimed to have no interests there, may explain in part the absence of some of the important American electrical exhibits. But unfortunately these local companies do not always follow our practice, and do not manufacture the goods on the same scale and in the same way, so that their exhibits were not as a rule representative of our products.

England also was very inadequately represented in the electrical classes. The English claimed that they were tired of exhibitions, but another reason is no doubt the unfortunate political relation with France. England's exhibits in other groups also seemed to fail to represent the proper magnitude of the respective industries in that country.

Of all of those foreign to France, Germany, its former bitter enemy, had by far the finest exhibits in most of the groups, including the electrical. Another feature of interest politically is that Hungary had in many respects better exhibits than its stepmother country, Austria, and was represented as an independent nation; it bids fair to become one of the greater industrial countries of the East.

The question is frequently asked how the Paris exposition compared with the one in Chicago in 1893. As both were very large and creditable, a comparison becomes difficult and in order to give an opinion of any value one ought to have studied both equally thoroughly and under equally favorable conditions. It is also largely a matter of individual taste, and depends on the nationality of the one giving it, as also on the extent of his knowledge of French. The area of the Paris exhibition was 336 acres, which together with the annex made it about half as large in area as the fair in Chicago, which had about 1,000 acres. The average number of paid admissions seems to have been about double in Paris, due to the fact that it was so managed financially that the average admission was about seven to ten cents as compared with somewhat less than fifty cents at Chicago. Americans seem to have obtained their unfavorable views from antagonistic English papers.

It is thought safe to say that the Paris exhibition, taken as a whole, was more generally beautiful in details, but that it contained no single group as magnificent as the famous Court of Honor, nor were the illumination effects as fine as at Chicago, where they were electrical, while in Paris gas was largely used, the whole of the largest open area, the Champ de Mars, being a brilliant mass of incandescent gas lamps. Neither had as finely illuminated fountains as the exhibition of 1889 in Paris, although the background to the poorly illuminated fountains in the present exhibition, forming the famous Chateau d'Eau or Water Castle, was very beautiful and attractive.

Much else might be said about the exhibition in general, but we as electrical engineers, are more interested in the electrical exhibits. As was already mentioned above, these were representative of the state of the art only as far as the continental countries were concerned, as those from the United States and England were very deficient in scope. It was also stated above that it was less of an electrical exhibition than the one at Chicago. There were moreover no quite novel, epoch-making electrical inventions shown, although a few quite interesting ones that were already known to readers of the electrical journals, were exhibited there for the first time.

One of the striking features was the great prominence of three-phase generators, and their size. One obtains the impression that the three-phase current has triumphed over all the others, including the continuous current, when large amounts of power are concerned, and that it would be poor practice now to install large units of any but the three-phase system unless one is forced to use another.

There was shown a decided tendency toward the use of large units, and quite a number were exhibited having outputs of about 1,000 kilowatts and over. The greater number were for three-phase currents and all formed the fly-wheel of their direct-connected slow-speed engines, while all of the few large continuous current machines exhibited, had to have a separate fly-wheel. That the field is made the revolving part seems to be almost universal practice, as also the distributed winding on the armature. Single and two-phase alternators and large continuous current machines were the exception.

Two very ingenious attempts were shown to compound large, three-phase generators, without commutating the main current, one by Hutin and Leblanc and the other by Boucherot. Both excite their direct current and mechanically coupled exciter by means of the three-phase alternating current, the exciter therefore having a revolving field but fixed brushes: in both, the excitation of the exciter is dependent on the voltage of the alternator and on the main current, in the former by means of a shunt and series field magnet coil, and in the latter by means of a transformer combining the effects of both. To obtain direct current from such an exciter the connections between the commutator and the coils in the former are reversed according to a certain law, while in the latter the armature has several windings differing in their number of turns according to a sine law. Both claim to keep the voltage of the generator constant for different currents and load factors. It will be noticed that there is no commutation except that of the small exciting current in the direct current exciter. Whether they are better or worse than the commutating systems used here practice alone can decide. While they are interesting studies, it does not yet seem to be proved that for large units at least a cheaper attendant than these would require, with his hand on the rheostat and his eyes on the voltmeter, is not a more practical solution.

There were a number of inductor alternators exhibited, which indicates that they are meeting with some favor.

Connecting lamp circuits to three-phase generators does not seem to be considered a sufficiently serious matter to overbalance the advantages of that system. The method used by the General Electric Company of Berlin (that is, the Allgemeine Elektricitäts Gesellschaft, which even in Germany is generally abbreviated to A. E. G.) is simply to distribute the lights as evenly as possible over the three branches. All three mains are run into the buildings of even small consumers, although only two may be used, the third being available for changing over a batch of lamps, if necessary, for balancing. The voltage can thus be regulated only for all three branches together, and not for each separately; but this is not considered a serious disadvantage. The Oerlikon Company, on the other hand, connects lamp circuits between the ends of only two of the three branches of a star-connected winding, the third branch being then idle; this enables the voltage of that single-phase alternating current circuit to be regulated at the machine. By overloading these two circuits 15 per cent. the capacity of the generator is about the same as for motor circuits with a power factor of 0.8. The units in a station can then be alike, and it does not interfere with paralleling, or running motors and lights from the same machine if necessary. Another method used in Switzerland, but only with two-phase generators, is to construct a sort of double machine, the two halves of which may be mechanically displaced relatively to each other to generate two-phase currents for power purposes, or they may be connected in line with each other to generate single-phase currents for lighting.

The high voltage, direct current series system for power transmission and very limited distribution, made another and probably unsuccessful appeal for recognition, in the form of an exhibit by its indefatigable champion, Mr. Thury.

Among the various types of motors, the most interesting was the three-phase induction or Tesla type, which seems now to have demonstrated its superiority over all the others except perhaps the continuous current motor, upon whose field it is however encroaching very decidedly, with the present prospect of becoming its equal in importance. The largest company in Germany and perhaps in the world, estimates that its sale of three-phase induction motors will before long exceed that of its continuous current motors. Its very large factory, including even the rolling mill, is equipped with these induction motors mostly direct connected. There is a single textile factory in Switzerland in which 500 of these motors are used for direct driving. The induction motors almost exclusively of the three-phase and not two-phase type, are being introduced very largely now, especially in Germany and Switzerland.

A nearly uniform type seems to have been adopted by most of the makers. In this, the primary circuit is the stationary one and is distributed over the surface like a drum winding, as distinguished from the coils used in the earlier forms of Tesla. It is this distributed winding which is the chief improvement that has made them such a success; it seems to have been first introduced by Dobrowolsky in Berlin. The larger ones are almost always started with a resistance in the secondary external to the motor; in some cases a short-circuiting device is provided on the rotor for use after starting, so that the brushes may be raised while running to prevent wear. It will be noticed that in some respects this nearly universal practice abroad differs from that in this country, where even very large motors up to 800 hp., if not more, are made without any brushes, being started with a transformed current at lower voltage: others are made with the starting resistances on the rotor itself, which also dispenses with brushes.

One of the applications of three-phase induction motors which is of special interest, and which seems to have a promising future, is to traction. This three-phase traction system, which is scarcely known in this country, is in regular and apparently very successful use on a number of lines in Switzerland. A few of these roads were visited by the writer and as

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far as could be learned they were running very satisfactorily. The double trolley wire, which is essential, and which has often been urged as being such a serious objection, does not seem to give any trouble at all; each locomotive or car had even two contacts with each wire. Many of the alleged objections are overcome by the use of the contact bar instead of the trolley wheel, which completely avoids any jumping off of the pole, and greatly simplifies the overhead wiring at the switches, which is in fact not complicated at all. The motors are started with resistances in the secondary as usual. There is no complicated controller, as the two motors are always in parallel. The trains start well and without difficulty, and it seems without any very abnormal current. The chief objection to the system seems to be that the running speed is always the same, in which respect it is like a cable road; it is therefore not possible to make up lost time except on a down hill coast, while on steep up grades there is a considerable demand for power as the speed is always the same maximum. No system of efficient speed regulation is used, presumably because none has been found to be satisfactory. This seems to be the real and serious objection to the use of the system in this country, where high speed seems to be an essential requirement. One of the freight locomotives was provided with a purely mechanical device for halving the normal speed, but no other information could be obtained than that it was then in the repair shop.

While three-phase traction in its present state would probably not be practicable here for cities, there seems to be a field for it on long distance interurban lines with few stops, as it is much cheaper. The estimates for the Jungfrau Bahn showed that the first cost would have been 50 per cent. greater if the continuous current had been used on the locomotives, as is done in this country.

Returning to the subject of alternating current generators and motors in general, there is a characteristic difference between European practice and that in this country which seems worth mentioning. Here the coils are usually form-wound and then laid into open slots; there the wires are more generally threaded through completely closed holes as in the Oerlikon and Brown machines, or through holes of which the webs have been cut through with a very thin saw cut, as in the Dobrowolsky machines of the A.E.G. Mr. Brown gives the following reasons for his preference: lower magnetic resistance, smooth surface of core, seamless tube insulation, solid poles, ease in parallel running and avoidance of wedges, binding wire, etc.; his experience is that it takes as long to replace a form-wound coil as to thread in a new one in place. Dr. Behn-Eschenburg, the engineer of the Oerlikon Company, gives his reasons as follows: The smoothness of the surfaces enables the air gap to be made as small as 0.001 of the diameter in induction motors, which is hardly possible with teeth; with a web over the hole of only 0.1 mm. the coefficient of magnetic straying can be reduced to 0.04 and a maximum power factor as high as 0.92 can be obtained; the maximum torque will correspond with 3.5 times normal current, and the possible overload can be 2.5 times the normal; if the holes were changed into teeth, all else remaining the same, the magnetization current would be at least doubled, the straying coefficient reduced to about 0.03, and the best current for the resulting maximum power factor of 0.94 would then be more than doubled and the copper conductors therefore increased; or for the same load the power factor reduced to 0.91; the slotted armature would have to be made longer axially if it is to have the same current at no load as the one with holes; moreover, seamless insulation tubes of micanite can be used in the holes, which if 1 mm. thick will be quite safe for 3,000 volts. However he quite impartially recognizes the favorable features of slots with form-wound coils and admits that they may outweigh the others if a factory is suitably equipped for such work; he believes that under certain circumstances the one, and under others the other, is the better.

Another interesting characteristic difference between American and continental practice, is that here synchronous converters combined with transformers are more generally used for transforming high voltage three-phase currents into low voltage direct currents, while on the continent dynamos driven by high voltage induction or synchronous motors are the rule. Although the favorable features of each are well understood, the reasons given by such a successful constructor as Brown for preferring motor-generators, may nevertheless be of interest here. He states that they can be regulated with ease and precision; no transformers; both parts can be better designed without making concessions; no hunting; ease in starting; no depolarization possible; secondary voltage absolutely independent of the primary. He admits that the synchronous converter is cheaper and more efficient, but claims that the differences are but slight; he has obtained 90 per cent. combined efficiency for a 250 kw. motor-generator set.

In electric railroading there seemed to be comparatively little of special interest to Americans, besides the three-phase motor system and the contact bar, already referred to, both of which deserve more attention here than they are getting.

In electric lighting, one of the most interesting features was the debut of the Nernst lamp. After long and tedious labors on the part of the General Electric Company, of Berlin, the interesting laboratory experiment of Nernst, that a filament of a non-conductor like magnesia becomes a conductor after it is heated—has been developed into a form of high efficiency incandescent lamp, which is now claimed to be ready for the market; but although several hundred were burning there daily it was not possible to buy one. It resembles the usual incandescent lamp except that the bulb is open; the filament is somewhat thicker and much shorter than that of a carbon lamp; the light is very much whiter and more brilliant. It can be lighted with a match, alcohol torch or automatically by a platinum wire preheater with a magnetic interrupter. Either alternating or continuous currents can be used, but the filament must be exposed to the air. The lamps are made for 25, 50 and 100 cp. at 220 volts, and therefore do not yet compete directly with the usual 16 cp. lamp. The efficiency is said to be 1.5 watts per candle, or about twice as good as the present carbon lamp of the same voltage. The filament is said to be made of magnesia mixed with the rare earths like zircon, thorium, etc. The life is claimed to be very satisfactory, though no figures could be obtained, but the perishable parts, valued at only 25 per cent. of the probable cost of the lamp, can easily be replaced, the bulb being open.

The material of which the filament is made has a rapidly falling temperature coefficient, much worse than carbon, which would make it extremely sensitive to changes in voltage. This is overcome by a very ingenious method to which the present success of the lamp is due; it consists in placing a very fine iron wire in series with the filament, the wire being so proportioned that it is heated by the normal current to that temperature (about 450 to 500° C.) at which it has a very rapidly rising temperature coefficient; the resulting characteristic of the two in series is therefore a rising one. This fine wire consumes about 10 per cent. of the voltage. The price of the lamp, it is thought, may be about 50 cents.

The relatively large number of exhibits of switchboard switches for breaking currents of very high voltage, indicates the rapid introduction of high tension currents. In many of them the well-known double horn is used for extinguishing the arc, which is an indication of the effectiveness of this simple device.

A novel departure in switchboards, especially for dangerously high voltage machines, consisted in placing all the switching apparatus belonging to one machine on or under a post or pedestal near the machine itself and so that the attendant faces the machine. The actual switches are under the floor where they are out of the way and easily accessible from a pit below, only the levers, hand wheels and instruments being on the pedestal; the attendant is thereby protected from all possible danger. It is the standard practice of the Oerlikon Co.

The use of silver fuse wire in place of lead alloys, by a very large German company, on the ground of greater reliability and constancy, deserves mention. For the same fusing current the amount of metal volatilized is the least for silver.

Among the cable exhibits there were three for underground work in which multiple cored cables were subjected to 20,000 and 30,000 volts alternating, the insulation in one of these being impregnated paper without any rubber.

A German maker of aluminum goods showed that this metal can be welded without solder or flux by simply heating it to a certain definite temperature at which it softens. The use of aluminum line wires makes this simple method of interest to electrical engineers.

The number of different types of meters exhibited was about equal to the number of their exhibitors, but the Thomson meter in nearly the same form as made in this country, is the one most frequently used; several hundred a day are claimed to be made by the French company which manufactures them. The field for a good, cheap and simple ampere-hour meter for small consumers of continuous current is filled very satisfactorily in France by the O'Keenan meter, of which 11,000 are already installed. In principle it may be said to be like a d'Arsonval galvanometer or Weston instrument, in which however the coil is mounted so that it may revolve continuously, the number of its revolutions being registered. This coil or armature is a shunt to a very low resistance in the main circuit. It is extremely sensitive and the coil requires only 0.6 microwatt to start it; it will register as little as 5 watts in the lamp circuit or 1 per cent. of its range, has a straight line characteristic and is not appreciably affected by temperature changes. A somewhat similar one is about to be introduced in this country and there is no doubt a large field for it.

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The well-known and ingenious Aron double pendulum meter was well exhibited in various forms, including one for three-phase currents. It is said to be used to some extent in Germany but would probably not find much favor in this country.

An interesting and promising modification in the Thomson type of watt-hour meter, shown in the German section, consisted in using a three coil armature like that in the original Thomson-Houston arc light machines; this enables the same magnetic force to be produced by a much smaller weight of the revolving part, with several attending advantages of importance.

Prepayment meters are meeting with some favor and there might also be a field for them in this country among small consumers.

In telegraphy the exhibit which seemed to attract most attention was the very ingenious printing telegraph system of Professor Henry A. Rowland, of Baltimore. The sender merely presses lettered keys like on a typewriter, and at the other end the message is received in print on a sheet of paper ready for delivery, without requiring any operator. An alternating current of constant frequency is passed over the single line and operates synchronous motors, by means of which the necessary synchronism at the two stations is obtained. The different characters are transmitted by the suppressing of various combinations of the half waves of the current. At the receiver end those waves are received in a large number of relays, various combinations of which operate a few electromagnets for printing the characters and moving the paper laterally and lengthwise. The typewheel revolves continuously and the paper directly beneath it, is struck from below at the exact moment when the desired letter is over the paper. Four messages are sent at the same time in one direction, the line being loaned to each operator in succession for short recurring periods. This is then also duplexed, making eight messages simultaneously over one wire, each, it is claimed, at a speed of 45 words per minute. It does not seem to be used commercially yet, and whether it will be equal to or better than the printing telegraph system which has been in satisfactory commercial use between New York and Chicago for some time, devised by one of our members, can be determined only by equally severe tests.

There were several exhibits of the wireless telegraph system, though none by Marconi's company. The modifications were only in detail and did not include any way of making the system selective. It is now being introduced commercially and there are a number of installations in regular use.

Those interested in the controversy between the vertical and the horizontal telephone switchboard, found a good opportunity to compare them, as each was exhibited by its most ardent defender, the vertical board being advocated by one of our large and prominent companies, and the horizontal by a similarly prominent German company which is introducing it in its country, notably in Berlin. The chief advantage claimed for the latter is that two operators sitting on opposite sides can use the same board and that therefore the length of board for the same number of subscribers is halved.

Electro-chemistry was one of the electrical classes in which the most pronounced recent development was shown, although the exhibits were not sufficiently complete to show the true state of that art. This branch of electrical science has opened what promises to be one of the important fields in which there is an opportunity for great development. Products which not many years ago existed only as rare and expensive specimens, and some which were not even known, are now made electrically by the ton.

Electric furnaces were shown in operation. There was also a very fine exhibition of the extremely interesting collection of products obtained by Moissan in his classical researches. Judging from two other large exhibits, copper is successfully deposited directly in the form of mechanically strong tubes, simultaneously with the process of electrolytic refining. A single company in Germany refines electrically about 5,100 ounces of gold and 24,000 of silver a day.

A very large ozone apparatus was shown in operation, for sterilizing 200,000 cu. met. of water per 24 hours by the Marmier and Abraham process, but a confirmation of the claims made is very desirable.

In accumulators there was shown a general tendency, though not a universal one, to use Planté positives and Faure negatives, a combination which seems to have given the least trouble. Accumulators are now the rule and not the exception in continental lighting and traction stations. Now that the fundamental patents have run out in this country, we ought to use them more freely here. As an electrical flywheel and a comforting reserve in a central station, the accumulator has no equal.

The exhibitions of instruments were very fine, chiefly from France, England and Germany, but it would take too long to enter into a discussion of them here. That a d'Arsonval galvanometer is made with a sensitiveness of 1.2×10^{-10} amperes per mm. deflection, is of interest; it is claimed to be the highest sensitivenes yet reached with that type of instrument. Among the station and laboratory instruments which are not generally used in this country, put which are very convenient, are the phase meters of Dobrowolsky, indicating directly the difference in phase. A curious, but characteristically Europen criticism of a certain world-renowned type of American instrument, was, that "they are bad because they are expensive."

DYNAMO ILLS AND REMEDIES.*

A dynamo or motor, carefully installed and properly running, is truly a thing of beauty to those who have the care of it, and a source of satisfaction to its owner. Trouble, however, in one form or another is sure to come sooner or later, depending on the grade of the machine and the skill and care in handling.

It is therefore likely that a few hints as to the cause and remedy of such troubles will be acceptable to those who have the care of this class of machinery.

Obviously, the promptness with which such troubles are located and removed will have much to do with the success of the plant. Often, indeed, considerable expense is incurred in removing a fault, which with a little intelligence could have been remedied at trifling cost.

For instance, so slight a thing as a loose connection will often cause the shutting down of a whole factory with scores of hands. Other troubles equally as simple but not so easily located will cause annoyance and delay. In such cases, some knowledge on the part of the man in charge in locating troubles would have enabled him to overcome the difficulty and save delays and consequent loss.

Fortunate it is that the machines in question are mechanically so simple in their construction. With the exception of commutator and brushes there are but two wearing parts, the two bearings which support the shaft of the armature, quite in contrast in its simplicity to the steam engine with its multiplicity of wearing parts, oil cups and valves.

From the fact that the dynamo or motor has so few parts, we are able to classify their troubles through their effects under five heads, which are:

1. Sparking at commutator.
2. Heating of the various parts.
3. Noise and speed.
4. Motor stops or fails to start.
5. Dynamo fails to generate.

Any and all of these effects are quite obvious, even to a casual observer; still a most careful and thorough examination should be made of the entire machine in order to be sure of facts and to avoid jumping at conclusions.

In the consideration of troubles as classified above the following order will be observed: First, the cause; second, the sympton in detail; third, the remedy and how effected.

As is very often the case, a symptom may be developed in a machine from several causes, or a cause may result in several symptoms. We shall, however, endeavor to make the distinction as clear as is possible without the help of the actual machine for illustration.

Sparking at the commutator is caused, first, by the armature carrying too much current, due usually to an overload; in the case of the dynamo, too many lamps in circuit; or in the case with the motor, excessive frictional load, from hot bearings, armature striking the pole pieces, belt too tight, or in general, too much mechanical work to be done. Excessive voltage on constant potential circuits will also overload the system.

The symptoms are a continuous sparking at the commutator during the time of maximum load and tendency to slipping of the belt.

After a continuous run, the armature becomes very much overheated and will burn out if the load is not lightened.

In this, however, there is an exception, constant current arc motors. As the heating effect depends on the square of the current multiplied by the resistance ($C^2 R$), both of which factors are constant in this instance, it is quite possible to overload machines of this type till the armature stops without risk of burning it out.

Excessive friction load is readily detected by turning the armature around by hand.

Hot bearings will be treated more in detail under the head of heating of the various parts.

An excess of current is, of course, at once evident at the ammeter, and this may be taken as a conclusive test for all such overloads.

The remedy, for troubles of this nature, is obviously to reduce the load and eliminate partial short circuits in the line and leads as far as possible.

Constant potential motors, especially those above five horse-power, are frequently subjected to overloads and strain at starting.

*From the "National Engineer."

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If the starting-box has too little resistance or is turned on too rapidly, it will cause the armatuer to start with a jerk and spark badly at first. A properly designed starting box will remedy the evil in the first instance, and in the latter case, the exercise of proper care in starting. The handle of the starter should be allowed to remain an instant on the first and second contact points till the armature has attained some speed.

Again, brushes are sometimes not set at neutral points. The symptom of this trouble will be a sparking and cutting at the commutator, the intensity of which will vary with the shifting of the brushes.

The remedy can best be explained by referring to Fig. 1, which shows the proper position of the brushes. The points where the brushes are resting on the commutator where the greatest E.M.F. and the least sparking are obtained, are called the neutral points, as represented in the cut by the points "A" and "B."

The line joining these two points has been termed the diameter of commutation. It will be noted that this line is not at right angles to the line joining the centers of the pole pieces, but is shifted through a small angle, depending on the direction of rotation and whether the machine is acting as a dynamo or motor.

With the dynamo, the brushes will be given

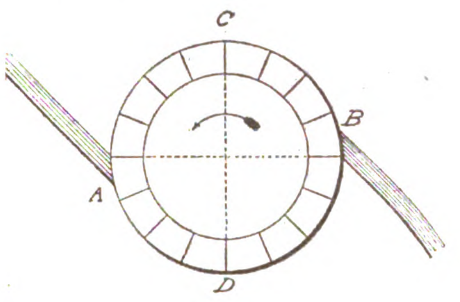

Fig. 1.
The Diameter of Commutation.

a forward lead, that is, they will be shifted from the horizontal in the direction of rotation.

With the motor, the shifting of the brushes will be against the direction of rotation and will be given what is termed a backward lead.

In most dynamos and motors the exact position of the neutral points cannot be fixed, but will vary according to the load of the machine. For instance, in the case of a dynamo with a given number of lights burning, the brushes may be properly set at the neutral points and run without sparking. Now let the number of lights burning be increased or diminished to any considerable extent and sparking, more or less destructive, will commence and continue till the brushes have been shifted to the new neutral points by means of the rocker arm. These points are determined only by trial.

This shifting of brushes, or giving them a lead as it is called, is necessitated by armature reaction or the magnetizing effect of the current in the armature, tending to create a powerful magnetism which distorts the field.

Right here we will state that there are some dynamos and many motors in which it is not necessary to shift the brushes, no matter how much the load changes. In these the field has been made strong enough to overpower the armature reaction. Again in another class of dynamo, the moving of the points of contact is taken advantage of as a method of increasing or decreasing the E.M.F. This is the case of constant current arc machines.

It is not only necessary to shift the brushes to the neutral points by means of the rocker arm, but care should be taken to see that the brushes are diagonally opposite each other. This can be accomplished by counting the number of segments of the commutator, measuring with a piece of thread or other device, marking the opposite segments, and setting the brushes to this mark.

The setting of brushes is perhaps the most important duty of the dynamo tender, for a

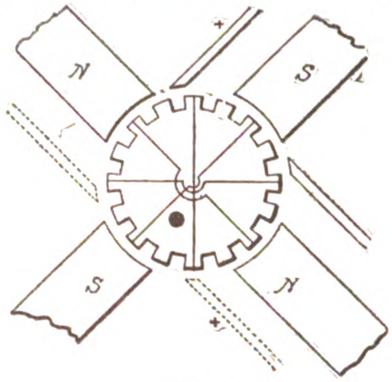

Fig. 2.
Circuits of Cross Connected Armature. Four Poles; Two Brushes.

brush, a fraction of a segment out of position, will often cause serious sparking.

Exceptions to the rule for setting brushes diametrically opposite will appear in the case of multipolar motors with cross connected armatures.

These machines may be supplied with two sets of brushes or as many sets as there are poles. For instance, four pole machines with two sets of brushes require them to be set at 90 degrees apart; 6 pole at 60 degrees, or 180 degrees, and so on.

Fig. 2 shows the armature connection and the position of the brushes in a four pole machine with cross connected armature. The arrows mark the direction of the current in the armature connection. It is apparent, therefore, that no one should attempt to set the

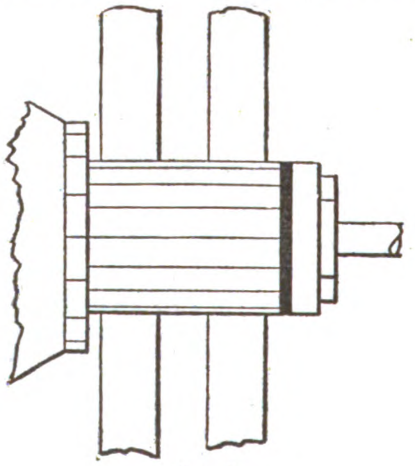

Fig. 3.
Commutator in Good Condition.

brushes on such a machine without first determining from a blue print or other source their correct position, and then keeping them there.

Should the brushes be set very far out, they will probably cause the safety fuse to blow and in the case of a dynamo it will fail to generate.

The commutator may have high bars or low bars due to loose shell or an unusually hard specimen of copper.

A poor connection between the leads and the tongue of the commutator segment, will also develop a flat, hard mica between the segments which does not wear down as fast as the copper; all of these produce a rough commutator.

The symptom in this case will be a chattering of the brushes, accompanied by sparking, which is sometimes apparent by the sound. By touching the commutator with the top of the finger the least roughness is at once apparent. Turn the armature slowly by hand when any eccentricity will be indicated by a rise and fall of the brushes.

The commutator as it should be is represented in Fig. 3, with brushes properly set and the surface of the commutator smooth and glossy.

Accompanying is a sketch of the same commutator in bad condition. The commutator being scarred and rigid and the brushes badly set.

In cases where the commutator exhibits eccentricity or is deeply cut, the armature should be taken out, accurately centered in a lathe and the commutator turned off, taking off as light a chip as possible.

In large armatures it is often more convenient to rig up a special slide rest and turn off the commutator while the armature is turned at slow speed in its own bearings.

A loose bearing will also cause chattering of

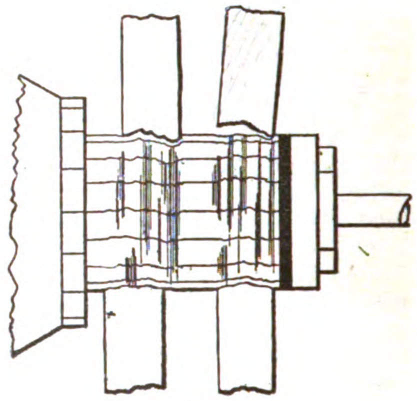

Fig. 4.
Commutator in Bad Condition.

the brushes with the attendant sparking and cutting of the commutator. If the bearings are loose and worn they should be re-babbitted or new ones put in.

A slide rest which clamps on to the pillow block in place of the rocker arm is shown in Fig. 6.

A slightly rough commutator can be dressed down with a fine file and given a final application of fine sand paper, the armature being turned at medium speed.

If the machine in question is a dynamo it is advisable to raise the brushes, start the engine at medium speed and apply the file or sand paper, or both, as the case may be, thus avoiding clogging the brushes with dirt and copper dust.

With a motor it is different, as we must rely on the current to turn the armature. It is therefore an exceedingly dangerous practice to use a file, although sand paper may be applied without danger. It is a good plan to put a little oil on the sand paper, for in this way the particles of copper are gathered and prevented from flying into the armature, thus increasing the danger of short circuits or burnouts.

It may be stated as an axiom that copper dust and metal filings in general should not be allowed to collect about a dynamo or motor.

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For this reason emery cloth should never be used on the commutator, as the particles of emery are so sharp they become lodged in the copper of the segments, thus converting the commutator into a veritable grinding tool. Again the particles get into the mica and cause short circuits.

Brush-holder screws sometimes become loose and the brushes get tipped up so they touch only at one point. Very often vaseline or oil has been applied too freely and the commutator has become dirty. The springs which give tension to the brushes may have lost their temper from carrying the current, though this is an indication of a faulty design of brush-holder. The bearing part may have been clogged for some reason so that the holder does not work freely—though the spring may

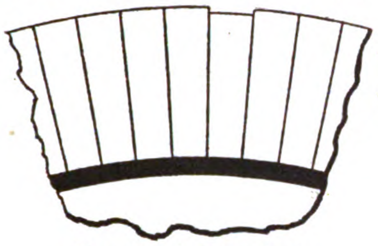

Fig. 5.—A Low Bar.

still be good. Hard carbons that will not adjust themselves in wearing to the commutator, and which sometimes offer exceedingly high resistance, also induces sparking at the commutator.

Copper brushes can best be filed for adjustment to the commutator in a jig made for the purpose.

The simplest way to adjust carbon brushes is to first wrap a piece of sand paper around the commutator, having the rough side of the paper turned out; then set the carbon brushes down tightly against this surface, revolving

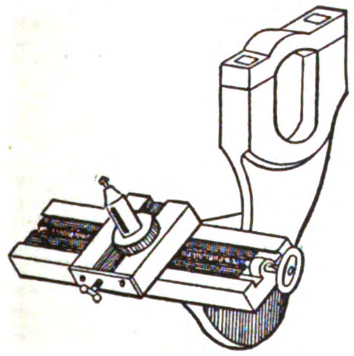

Fig. 6.
A Tool Clamping on Pillow-Block Used to Turn Off Commutators.

the armature by hand while the brushes will be rapidly and accurately shaped to the surface.

The best way to keep a commutator clean is to wipe it at intervals with a piece of cotton cloth or felt slightly moistened in vaseline.

A motor with short circuited coils or bad grounds will draw excessive current, even though running free of load. A dynamo will require considerable power though there is no evidence of power in external circuit; in either case violent sparking will result.

The symptom most apparent will be a heating of the coil or coils affected, and the attendant will become warned of the danger by the odor of the burnt cotton insulation.

A short circuited armature coil often results from allowing copper dust to collect back of the commutator or when excessive sparking of the brushes has formed little bridges of metal across adjacent commutator segments.

Short circuits in parts of the coils of an armature frequently occur from injuries to the insulation, from external mechanical sources, for instance, the dropping of little particles of material in the spaces between the armature and pole pieces while the armature is in motion. A screw, for instance, or even little balls of waste, and more frequently oil and dirt, cake on the faces of the pole pieces, scraping the insulation off the wire.

A piece of iron, a screwdriver or key, for instance, held between the field magnet, near the revolving armature, will vibrate very perceptibly as a short circuit coil passes.

In the case of a motor, an armature affected with a short circuited coil will revolve slower than usual and unsteadily, while in aggravated cases it will draw up with a jerk before the pole piece.

Ills such as those described as short circuits due to deposits of copper dust back of the commutator or the bridging over of segments from sparking may be located by careful inspection and removed by scraping clean the mica insulation between the segments.

Short circuits, due to mechanical injury to the insulation of the wire of the armature, require careful handling, as these injuries generally extend before the first layer of wire.

In most cases it is possible to carefully lift the wires, one at a time, high enough to wrap it with silk tape.

Wires thus raised and insulated must be carefully pounded back into place with a wood block or mallet, the affected part being then treated with a coating of good shellac.

A short circuit which is in the coil itself and below the surface cannot be treated thus and the only real remedy is to rewind the coil.

Two or more grounds in an armature, occurring usually from insufficient insulation on the core, are equivalent to a short circuit and must be treated in the same way, viz., by re-insulating and rewinding the armature.

The commutator will flash violently when the broken coil passes under the brush and it will be found that the mica, surrounding the segments attached to the broken coil, will be blackened and burnt and gradually pecked away.

This break will often be found in the leads where the armature wires connect with the commutator, as in some types of machines they are subject to heavy drag. Usually they can be easily repaired by splicing.

An overload may cause the soldered connection of the leads to the commutator to melt and thus develop a break. The only available remedy is to solder in the leads again and guard against overload in the future.

Care must be exercised in the soldering process lest drops of molten solder drop in behind the commutator and short circuit some of the segments.

When the trouble cannot be so easily located and is evidently in the interior of the coil, the coil thus affected will have to be rewound.

The trouble, however, may be temporarily remedied by cutting out the coil, either by bridging over the disconnected segment with a drop of solder or by staggering the brushes, as it is called, that is, setting one of a pair a little ahead and the other a little back of their normal position, which is equivalent to bridging over the break.

In adopting this method, care must be taken not to short circuit a sound coil, as this will cause sparking and a dangerous heating of the affected coil.

These devices are at best only "make shifts" and should only be adopted to prevent a very undesirable stoppage.

Field troubles cause sparking at the brushes and are of two kinds, open circuits and short circuits.

A dynamo thus afflicted does not generate at all or does not come up to its full electromotive force. The pole pieces are not strongly magnetic.

A constant potential motor has a tendency to race unless the field is very weak or is lacking altogether, in which case it may either run slow or stop and blow the fuse.

The cause for such trouble is usually a broken circuit or a partial short circuit in one or both of the fields.

In order to test for an open circuit in the field of a motor, block the brushes up from the commutator with pieces of wood or paper, then turn on the current, remove the field wire from its binding post and absence of spark at the breaking of the circuit will indicate a complete break somewhere in the circuit.

In cases of field trouble in isolated dynamos where current is not obtainable, it will be necessary to remove the terminals of the field circuit from their binding post and ring through it with a magneto or bell and battery.

Short circuits in field coils may be determined by measuring, with the proper instruments, usually a portable bridge and galvanometer, the resistance in each magnet coil. Any appreciable difference in the resistance of the magnets will indicate that the one of least resistance has been short circuited.

A machine thus affected will spark more at one brush than at the other when running, and it will further be noticed that the short circuited magnet will heat less than the sound one, which in turn will be above the normal.

The remedy for such troubles is to remove the faulty magnet and unwind the wire on it till the break or ground is found, when the fault may be repaired and the wire wound back again.

It may be stated here that a frequent cause of short circuits in field magnets and armature is due to the soaking they receive from oil thrown out by faulty bearings.

Oil, soaking into a field, seems to have the effect of rotting the insulation on the wire and a short circuit or ground is the result.

A carbon brush of high resistance may cause sparking because of its poor contact with the commutator. A charring or burning of the brush about the edges will be noticed and the brush itself becomes hot, in which case supply a softer brush.

Again, vibration in the machine due to insufficient foundation is frequently a cause of sparking. It will be found to decrease when the machine is braced. Often nothing more is needed than a slight increase in the tension of the brushes. The better way, however, is to secure the machine firmly to a good substantial foundation of masonry.

A chattering of the brushes is sometimes due to a dirty and sticky condition of the commutator. This is apt to be the case with radial carbon brushes. To remedy this wipe the commutator clean and then lubricate it with oil or vaseline rubbed on with a piece of cotton cloth or felt.

A trouble to which the same armatures are

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liable, and which is sometimes very difficult to locate, is what is termed a flying break.

This will develop after the armature is in motion, causing violent sparking with every indication of an open circuit, but will not be apparent to tests made when the armature is stationary. It can usually be found by careful inspection of the back and can be repaired with thoroughly good soldered joints.

Lundell Octagon Type Motors for Automobiles.

Experience has demonstrated the fact that electric motors are the most satisfactory method of operating self-propelled vehicles. The electric carriage is the most convenient, the simplest, the safest and most desirable from all standpoints. It runs smoothly and quietly and is easily controlled.

The Sprague Electric Company, whose reputation for building electric motors has never been surpassed, has designed new motors for automobiles that will meet the demands of the most critical manufacturer. These motors were designed under the personal supervision of Mr. Robert Lundell, the well-known inventor of electric motors, and are guaranteed to stand the requirements of the most exacting conditions.

The same care that has made the reputation of the Lundell motors has been used in the selection of material and the construction of each detail, which, combined with the correct principle of design, has produced a motor that is compact, reliable and unequalled for efficiency.

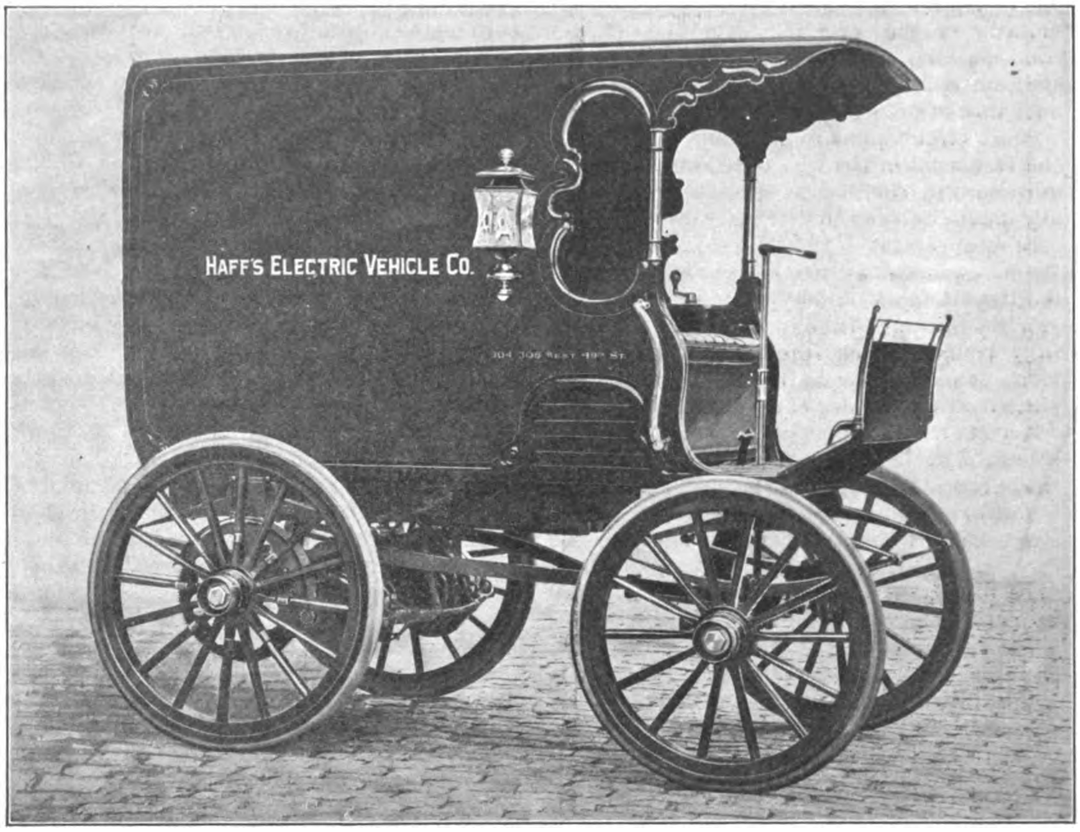
The Lundell octagon type motors are designed especially for automobile service, and are perfectly rigid and free from rattling or shaking of parts due to vibration. They are made for either single or double motor equipment as may be desired. In the single equipment the motor having a double commutator is used, while the double equipment takes two motors each with a single commutator, the idea being to use two commutators to each vehicle.

The motors are usually wound for 80 volts, but can also be wound for other required voltages.

When the octagon type of motor is used in connection with different apparatus (other than automobiles) it is ordinarily furnished with feet. The feet, however, are dispensed with for automobile work and the end castings are furnished instead, with lugs or bearings to suit the style of suspension and running gear.

These motors are entirely enclosed, but have removable covers over the commutator. They are practically dust and water proof and invulnerable to accidents or injuries.

A controller especially designed by the Sprague Electric Company enables the operator to have perfect control of the vehicle at any time, and will withstand the hard usage resulting from frequent starting, stopping and heavy overloads. The matter of overloads has been carefully considered, enabling the motors to respond to a demand far in excess of their rated capacity without injurious heating or sparking.



Electric Vehicle Equipped with Lundell Motors.

PERSONAL MENTION.

Mr. Duncan McDonald, superintendent of the Montreal (Can.) Street Railway, has been appointed to the general superintendency of the General Traction Company of Paris, France, and will enter upon his duties about the first of the year.

Mr. James Shaler Hodges, A. B., has been appointed an assistant instructor in the Rensselaer Polytechnic Institute at Troy, N. Y.

INCORPORATIONS.

The Pearne Electric & Manufacturing Company, Grand Island, Neb. Capital stock, $150,000. Incorporators: F. D. Pearne, W. S. Pearne, W. D. Pearne, L. W. Lyons and T. O. C. Harrison, all of Grand Island.

The Central Electric Company, Louisville, Ky. Capital stock, $10,000. Incorporators: J. S. Carill, P. M. Gelatt and W. C. Hines.

The Columbia Electric Light Supply Company, Jersey City, N. J. Capital stock, $50,000. Incorporators: C. E. Sutherland, Yonkers; Frank L. Eckerson, New York, and George W Flaacke, Jersey City.

The National Safety Third Rail Company, Charleston, W. Va. Capital stock, $5,000,000.

The Union Electric Company, Camden, N. J.—to furnish electricity. Capital stock, $200,000. Incorporators: F. R. Hansell, G. H. B. Martin and William F. Eidell.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED NOVEMBER 20, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

661,975. Trolley. Henry S. Goughnour, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 12, 1899.

662,009. Trolley. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Jan. 18, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

661,986. Supporting Block or Bracket for Electric fixtures. John W. Heiser, Chicago, Ill. Filed Dec. 30, 1899.

662,048. Electric-Arc Lamp. James J. Wood, Fort Wayne, Ind., assignor to the General Electric Company of New York. Filed July 28, 1898.

662,369. Terminal Connection for Electric Lamps. Alexander J. Wurts, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed Jan. 27, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

661,972. Controller for Electric Motors. Frank W. Garrett, Johnstown, Pa assignor to the Lorain Steel Company of Pennsylvania Original application filed March 26, 1900. Divided and this application filed June 5, 1900.

662,038. Controller. Emmett W Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 28, 1899.

662,042. Dynamo-Electric Machine. Francis W. Throop Niagara Falls, N. Y. Filed Jan. 29, 1900. Renewed Oct. 15, 1900.

662,049. Automatic Circuit-Breaking Apparatus. Granville T. Woods Monsey, N. Y. Filed Aug. 24, 1898.

662,316. Magneto-Electric Machine. Frederick R. Simms, London, Eng., and Robert Bosch, Stuttgart, Germany. Filed July 5, 1900.

662,358. Controller for Motors and Brakes of Electric Cars. Adolphe Grossman, New Orleans, La. Filed July 5, 1900.

662,375. Multiple-Voltage Controller. Gano S. Dunn, East Orange, N. J., assignor to the Crocker-Wheeler Company of New Jersey. Filed March 21, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

661,988. Telephone Receiver. Harry H. Hipwell, Allegheny, Pa., assignor to Hipwell Manufacturing Company, same place. Filed Feb 10, 1900.

MISCELLANEOUS.

661,971. Control of Electric Motors. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed March 26, 1900.

662,020. Means for Rapidly Transmitting Telegrams. Anton Pollak and Josef Virag, Buda-Pesth, Austria-Hungary, assignors of one-half to Vereinigte Elektricitats Actien-Gesellschaft, same place, and Friedrich Silberstein, Vienna, Austria-Hungary. Filed May 9, 1899.

662,021. Method of Rapidly Transmitting Telegrams. Anton Pollak and Josef Virag, Buda-Pesth, Austria-Hungary, assignors of one-half to Vereinigte Elektricitats Actien-Gesellschaft, same place, and Friedrich Silberstein, Vienna, Austria-Hungary. Filed Dec. 21, 1899.

662,032. Automatic Fire-Alarm Device. Ernest F. Sitts, Herkimer, N. Y. Filed July 10, 1899.

662,039. Control of Electric Motors. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Application filed June 8, 1900.

662,090. Process of Manufacturing Carbons for Electrical Purposes. Eduard Pohl, Kalk, Germany, assignor, by direct and mesne assignments, to Adolph Schenck, Bergedorf, Germany. Filed Aug. 29, 1899.

662,234. Circuit-Closing Device. Edgar W. Hazazer, New York City. Filed Oct. 7, 1899.

662,277. Separator for Secondary-Battery Plates. Henry Leitner, London, Eng., assignor to the Electrical Undertakings, Limited, same place. Filed May 28, 1900.

662,278. Aural Battery. Christopher W. Levalley, Milwaukee, Wis. Filed July 17, 1900.

662,286. Electrolytic Apparatus. Emanuel Motz, Jefferson, S. C. Filed May 26, 1900.

662,315. Sparking Igniter for Explosive-Engines. Alfred J. Signor, Elkhart, Ind. Filed Feb. 1, 1899.

DESIGNS.

33,593. Case for Slot-Telephones. William A. Foss, Cleveland, O., assignor to the American Bell Telephone Company, same place. Filed June 22, 1900. Term of patent, 7 years.

33,594. Telephone-Pole Box. William D. Gharky, Philadelphia, Pa. Filed Sept. 7, 1900. Term of patent 14 years.

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THE TELEPHONE WORLD.

Another Independent Company for Minnesota.

It is rumored that a plan is on foot to organize a local independent telephone company to be owned and controlled entirely by citizens of Minneapolis and St. Paul. The projectors believe that with local busines smen interested, with ample means, there would be little difficulty in procuring the necessary franchises. If the present plan is carried out, every telephone user will, so far as possible, be interested as a stockholder, so that the earnings of the system will inure to the benefit of the patrons. The failure of the Mississippi Valley Telephone Company to extend its system is believed to have influenced the men behind this project.

It was recently reported at Atlanta, Ga., that the Southern Bell Telephone & Telegraph Company and the Cumberland Telephone Company, operated exclusively in the Southern States are to be consolidated under a single management in the immediate future. Following this will occur the consolidation of all the Bell systems, including the consolidated companies of the Cumberland and Southern Bell, the Chesapeake and Potomac, the Chicago, New York and Boston, and all other systems under the direct management of the American Bell Telephone & Telegraph Company, with headquarters in New York.

The Black River Telephone Company is to construct a toll line south of Boonville, connecting Forest Port, Alder Creek, Remsen, Prospect, Trenton, Holland Patent and Utica, N. Y. The company now has connections north of Lowville with Carthage, Watertown, Antwerp, Gouverneur and all principal points to Ogdensburg; also south and west to Oneida, Syracuse, Clinton, Oriskany Falls, Waterville, Newport, Herkimer, Ilion, Frankfort, in the State, and all intermediate towns and villages. The company has direct telephone connections with about 125 toll stations. It is operating six exchanges and has seven more to build.

The Missouri & Kansas Telephone Company is considering making a proposition to the council of Kansas City, Kan., for another franchise. One of the concessions that will be asked for is the privilege of putting its wires underground, as the company desires to abandon its overhead wire system. This contemplated action on the part of the company has caused the council to temporarily postpone any action looking toward the reduction of telephone rates, and the ordinances that have been prepared will not be introduced if the proposition for a new franchise is presented in the near future.

The claims and judgments against the Mississippi Valley Telephone Company of Minneapolis, Minn., amounting to over $17,000, were satisfied a short time ago, and the company has been released from the writs of attachments which have been hanging over its head. All claims were wiped out, and the work of extensions and improvements will be pushed with all vigor possible by J. C. Hubinger and his assistants.

J. C. Kelsey, who has charge of the switchboard in the Minneapolis, Minn., office of the Northwestern Telephone Exchange Company, and five employes of the company, recently tried an experiment with a wireless telephone which, it is said, proved a success. The conversation was carried on from a distance of 200 yards, and a good, clear sound resulted.

A large telephone cable has been laid across the Ohio River above Rising Sun, Ind., by the Green Brothers, connecting their telephone system in Boone County, Ky., with their exchange centers in Ohio, Dearborn, Switzerland and Jefferson Counties, and about fifty Indiana cities. One was recently laid at Carrollton, Ky.

The Boyle Citizens' Telephone Company, which was organized in Perryville, Ky., about one year ago, and which has wires throughout Boyle, Washington and Mercer counties, has sold out to the East Tennessee Telephone Company, which will take possession at once.

The work of remodeling the telephone wire system in Santa Barbara, Cal., is about to be started. The company has greatly increased its business in that city during the last year. Its wiring system is therefore sadly inadequate to what is required of it.

Independent lines have bought the Mt. Sterling, Ky., plant, and will operate it in conjunction with the rest of the system in that State. A $75,000 plant is being put in at Louisville.

The Erie Telegraph & Telephone Company will abolish its Lowell, Mass., offices about December 1 and transfer the entire clerical force to Boston and New York.

Milwaukee 'Phone Invention.

Patents have been applied for and are about to be issued says a Milwaukee, Wis., paper, for an electrical device, called the Multiplex Telesig, a simple telephone system, calculated, upon long party lines, to allow any subscriber to be called without in the least disturbing others upon the same line. The inventors are W. S. Burnett and W. H. Goodhal of that city.

The call on the line is indicated at the main office by a telegraph key which is manipulated by the operator so as to tick off any of the dots or dashes of the Morse telegraph code. The principal technical device of subscriber's instrument is a cylinder. Compactly set around this cylinder and parallel with its shaft are small pins, which are depressed or remain in position as the operator dictates upon the key at the other end of the line. When the end of the particular call has been reached at the main office in the course of the dictation, a key in the box answering to its number falls into the cylinder and the bell rings up the 'phone of that especial number. Every key is, of course, different and answers to the subscriber's list registered at the main office. The pins in the cylinder always fall back into place at once by a self-acting spring and are thus at all times ready for a new impression.

The machine will be introduced to the public within seven months or so. It is possible with this system to maintain on a single circuit of telephone service, station signaling on railroads, police and fire signaling, messenger service, etc. In laying submarine mines for the protection of coast lines or cities any number of torpedoes could be placed upon a circuit and any one exploded without in the least disturbing any of the others. In wiring hotels, instead of running a net work of wires to the desk, one wire will be run down and any guest called up without disturbing the others.

In the police department at present the policemen can get the chief, but the chief is unable to get the policemen individually. At present one of the inconveniences of party lines is that one subscriber hears a bell rung for another subscriber and can listen if so minded. The new invention insures privacy.

It is predicted that the Bell Telephone Company and the Citizens' Company are going to have trouble in Medina, N. Y. The Citizens' Company had a franchise which expired and since its expiration it has started to put in the plant. The Bell Company there gives poor service. The Citizens' Company has secured about 90 subscribers in Medina, and the board of aldermen is somewhat perplexed over what action to take, as part of the citizens favor one company and part the other. The Citizens' Company will be connected with Middleport, Gasport, Lockport, Tonawanda, Niagara Falls and Buffalo, and with the Home Company of Rochester, and it claims that any action the trustees may take in the matter will not affect it because it has a decision in a case tried in Cortland, N. Y., which states that if the new company has subscribers in the village it may erect poles and establish its business, even though it has no franchise from that village, and can obtain none.

The Enterprise Telephone Company is putting in new poles, and making other improvements at New Martinsville, W. Va. This company has six lines leading from New Martinsville and reaches Clarksburgh, Weston, West Union, and most of the towns in the center of the State. It will put in a line to Wheeling by way of the Ohio River towns.

According to a report from Kansas City, Kan., an effort will be made to secure the passage of a bill at the next session of the Legislature giving cities of the first class the right to tax telegraph and telephone companies for each pole they erect on the streets. The Wyandotte County delegation will be asked to vote for and support the bill, and those who are interested in municipal reform expect to do all they can to have such a bill enacted into law.

The Minnesota Central Telephone Company will put in a local exchange at Buffalo, Minn. The central office will be connected with the company's main line and that of the Northwestern as well.

It is said that on January 15, 1901, the American Telegraph & Telephone Company will issue 80,000 shares of new stock to its shareholders at par ($100), thereby completing the issue authorized in the early part of this year.

The common council of Little Falls, N. Y., has granted a franchise to the Central New York Telephone & Telegraph Company.

A telephone exchange will be established at Coronado, Cal.

A new telephone company has been granted a franchise by the Paris, Tex., city council. Home capital is interested in it

A dispatch from St. Petersburg states that the telephone franchises were sold at auction on November 20. The new regime begins in November, 1901. The Government has prescribed the conditions of rental, and the franchises were given to the parties fixing the lowest subscription. The St. Petersburg municipality won in that city, agreeing to demand 45 rubles annually, compared with 250 rubles hitherto charged. The rates for subscriptions accepted are: Odessa, 48 rubles; Riga, 57 rubles; Warsaw, 69 rubles, and Moscow, 79 rubles. The prices for restaurants, hotels, etc., are 30 per cent. higher for a single user, and 10 to 20 per cent, lower for telephones in general use, the custom being to place telephones in a corridor for the use of the entire building. The long-distance lines remain the property of the Government.

A new telephone company to be known as the Fox River Valley Telephone Company, and to operate between Neenah, Menasha, Appleton, Little Chute and Kaukauna, has been organized in Appleton, Wis. The organization will begin with a capital stock of $25,000 which will be increased soon. The company will act in conjunction with the Wolf River Company, that has franchises in most of the above cities and by permission of which Appleton will be entered. All wires are to be underground and work will be begun in the spring. The following officers were elected: President, J. S. Van Nortwick; vice-president, John McNaughton; secretary, A. L. Hutchinson; treasurer, John Baer.

H. D. Stroud, of Minnesota, but now in the employ of the Chicago Telephone Company, has invented a meter for telephones. The meter is placed beside the subscriber's telephone and indicates to him the number of calls made. The present system of measured telephone service is unsatisfactory. Under the meter system he can tell at a glance just how many calls he has made.

The Cortland, N. Y., Home Telephone Company has made a contract and secured a right of way by which it will build a telephone line from Cortland to Syracuse, connecting with the plant of the Syracuse Telephone Company in that city. The contract for setting the poles between Cortland and Syracuse will be let at once and the line is intended to be in operation by January 1, 1901.

A telephone war will be inaugurated in Columbus, O., about January 1 between the Central Union, or Bell Company, and the Citizens' Telephone Company, or independent concern. The Bell people will make the cut. Residence telephones will be from $20 to $24 a year on single and from $12 to $17 for party lines. The general officers of the Central Union Company are in session there and confirm the story of the reductions.

John T. Colling, R. E. Daly, Edwin Heil, Thos. Kelly and John M. Scott of Cincinnati, O., have incoporated the Cincinnati District Telegraph Company, with a capital of $1,000. They will do a general telegraph and telephone business in Ohio and other States.

The Ottumwa, Ia., Telephone Company has filed articles of incorporation amended so as to increase the capital stock from $40,000 to $75,000.

The city council of Arcadia, Fla., recently gave J. J. Head and his associates a franchise to put in a telephone system.

TELEPHONE INCORPORATIONS.

The South Whiteley Telephone Company, South Whiteley, Ind.—to operate a telephone exchange. Capital stock, $3,000. Incorporators: A. H. King, H. E. Rauman, F. S. Remington, D. C. Scott, all of South Whitley.

The Philadelphia Messenger 'Phone Call Company, Wilmington, Del.—to use electricity in all its branches. Capital stock, $100,000.

The Vermilion County Telephone Company, Danville, Ill. Capital stock, $60,000. Incorporators: Charles F. Haworth, William Henderson and John Fletcher.

The Gaston Telephone Company, Stanley's Creek, N. C. Capital stock, $10,000. Incorporators: M. C. Hunter, E. L. Pegram, Jr., and C. D. Homesley.

The New Washington Telephone Company, New Washington, O. Capital stock, $5,000.

The Yorktown Telephone Company, Yorktown, N. Y.—to operate lines in Westchester County. Capital stock, $2,500. Directors: T. F. Tompkins and E. B. Kear, Yorktown Heights; C. W. Pugsley, Peekskill.

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GENERAL ELECTRICAL NEWS.

Lighting.

Allegheny, Pa.—The Pennsylvania Light, Heat & Power Company will erect an electric light plant.

Almonte, Ont.—The citizens of this city have voted to issue $30,000 in bonds for erecting an electric light plant.

Arlington, Ore.—Messrs. Jackson & Nichols, of Everett, Wash., propose to put in an electric light and waterworks plant here as soon as arrangements can be made.

Auburn, Neb.—A company is being organized here for the purpose of asking the city council for a franchise to put in an electric light plant.

Baltimore, Md.—The Roland Park Company will issue $200,000 of bonds for improvements and extensions to the present electric light plant.

Chain of Rocks, Mo.—The measure providing for the erection of an electric light plant here, and also to furnish power to illuminate the waterworks and water towers and operate an electric railroad from Humboldt avenue to this place, introduced by Delegate Charles F. Kelly, was passed by the House of Delegates a short time ago.

Colorado Springs, Col.—The plant of the Colorado Springs Electric Company was badly damaged by a recent hurricane.

Crossville, Tenn.—A number of citizens have resolved themselves into a company, to be called the Crossville Electric Light & Power Company, and will apply for a charter. The company is capitalized at $2,000 and will light the streets, homes and churches.

Deshler, O.—The electric light plant here has been sold to F. Maurer of Bloomville, who has taken possession, and will overhaul the plant, add new boilers and machinery, and put it in first-class order.

Glendive, Mont.—C. H. Patterson, W. Lowe and G. Lander have filed articles of incorporation of the Glendive Electric Light & Power Company. The capital stock is $10,000.

Great Neck, N. Y.—The residents of this place and Thomaston are pleased to learn that the Arcadian Electric Light & Power Company of Manhasset, has been granted permission to extend its service to these places.

Gunnison, Col.—This place is to have a competing electric light plant, to be erected by W. H. Endner and Charles E. Meyer, who promise light, heat and power to the people of the town at a much lower rate than they are now paying.

Hughesville, Pa.—The Hughesville Electric Light Plant was recently destroyed by fire.

Irwin, Pa.—The stockholders of the reorganized Irwin Electric Light & Power Company have decided to increase their bond issue from $50,000 to $120,000, the additional amount is to be used for betterments and to enlarge the plant.

New York City.—New electric lights have been placed at the ends of all the benches in the new waiting room of the Grand Central Station. They consist of one large incandescent light surrounded by five smaller ones and mounted on wrought-iron supporting columns.

Parsons, Kan.—H. Levi lately made a proposition for parties out of town to furnish an up-to-date electric light plant if the city would give a 10-year franchise and take 70 or 80 lights at $4.80 per light per month.

Portland, Ore.—It is said the Roseburg Water Company will soon begin active work on a new electric lighting plant.

Red Lion, Pa.—The Red Lion Electric Light Company has decided to rebuild the plant recently destroyed by fire. The new structure will be supplied with all the latest improved machinery.

South Bend, Wash.—After five years of darkness, due to a heavy indebtedness, the city council has entered into a contract with the electric light company to light the streets of this place.

South Englewood, Ill.—This place is to have more electric street lights.

Sullivan, Mo.—The Hodgman Manufacturing Company contemplates erecting an electric light plant at its factory.

Sumpter, Ore.—W. H. Watt of Hailey, Idaho, will erect an electric light plant on the Hood River to furnish power for mining to cost $300,000.

Versailles, O.—Bids will be received until December 12 for furnishing materials and labor for the construction of an electric light plant in this village. Address L. C. Klipstine, secretary.

Williamsport, Md.—The electric light plant in this place is on the verge of closing down, owing to the failure of the water supply, which is obtained from a large spring near by.

York City, Pa.—The Merchants' Electric Light, Heat & Power Company has been organized by C. H. Bear, president; T. B. Loucks, secretary. The new organization proposes to apply for a charter at once for the purpose of furnishing light, heat and power within the precincts of the community and throughout this city.

Street Railways.

Birmingham, Ala.—E. F. Enslen and others are interested in a new system of electric railways to be built in this city and are forming a company for this purpose.

Blanchester, O.—Messrs. E. D. Smith, D. W. Hogan, M. V. Whitacre and others of this place are interested in a proposed electric railway from here via Fayetteville and Georgetown to Ripley.

Easton, Pa.—The Easton Consolidated Electric Company has accepted an offer of the Johnson syndicate to lease the former's entire system of electric roads in Phillipsburg, N. J., and Easton, and the lines from Easton to Bethlehem and Nazareth. In all there are about 30 miles of track.

El Paso, Tex.—The El Paso & Juarez Traction Company has completed all the arrangements to build its electric line in El Paso and suburbs. A. Mills and J. A. Happer are directors of the company.

Flat Rock, Mich.—The council of this place has granted a franchise to the Toledo & Detroit Electric Railroad Company allowing it to build a line through this village on Church street.

Ionia, Mich.—The Ionia common council has granted an electric street railway franchise to the Howard Company of Grand Rapids.

Lancaster, Pa.—The Lancaster, Willow Street, Lampeter & Srassburg Railway Company has been incorporated with $150.000 capital stock to build an electric line ten miles long in Lancaster County.

Lexington, Ky.—The Lexington Railway Company will expend about $30,000 on improvements to its power house.

New York City.—The work of equipping the Broadway, Lexington and Columbus avenue street car lines with the underground trolley system has been completed. President Vreeland of the Metropolitan Street Railway Company said recently that the electric cars would not be operated on the old cable lines for four months yet because he did not consider it advisable to test the new arrangement in winter.

Norwalk, O.—The Sandusky, Norwalk & Southern Railway Company has been incorporated with a capital stock of $400,000. The new company intends to extend the present road from its terminus at this city to Mansfield and use electric motive power. It will carry passengers, freight and United States mail.

Salt Lake City, Utah.—The council has granted permission to the Salt Lake City Railroad Company to build a double track street railway in this city to be operated by either electricity or compressed air. R. C. Naylor, city recorder.

South Orange, N. J.—The first experiment in carrying freight by trolley in Essex County is about to be tried between Orange and this place upon the road of the South Orange & Maplewood Traction Company.

St. Charles, Mo.—At a recent meeting the city council granted a franchise to the St. Louis, St. Charles & Western Railway Company to operate an electric road over certain streets of this city.

St. Joseph, Mo.—Eastern capitalists headed by J. P Gibson of Philadelphia, are said to have completed a deal for the construction of an electric railway between Kansas City and this place on the east side of the Missouri River.

Toledo, O.—This city is to be connected with Sandusky by an electric line. The Sandusky Interurban Electric Railway Company has filed with the Erie County Commissioners a petition for a franchise to lay tracks and string trolley wires from a point near Ruggles' Beach to Berlin Heights, thence to Berlinville, and from there to the county line. Mr. Woods is manager.

Whittier, Cal.—D. H. Thomas has filed with the city council an application for a franchise to operate an electric railway in certain sections of the city.

Manufacturing.

Charleston, W. Va.—The Electric Paper Manufacturing Company has been organized here with a capital stock of $5,000,000.

Chicago, Ill.—John Anderson, Charles A. Anderson and Milton Stamm, are interested in a new concern located here, and known as the Tinthoff Electric Company, which will manufacture electrical machinery and apparatus with a capital of $2,500.—The Baird-Chandler Manufacturing Company of this city has increased its capital stock from $10,000 to $50,000, and its directors from three to five .The object of the concern now is the manufacturing and dealing in electrical appliances.

East Orange, N. J.—The Morris Electric Company of New York has decided to build a factory here for the manufacture of street cars and a general line of electrical supplies.

New York City.—The Dynelectron Company has lately obtained a charter which gives it the right to manufacture and deal in electrical supplies and those of the company's invention. The capitalization of the concern is $1,200,000. George W. Angle is one of the interested parties.

Peterboro, Ont.—Manager Nicoll, of the Canadian Electric Company of this place, has, for $750,000, obtained control of the Royal Electric Company of Montreal, thereby practically obtaining a monopoly of the electric manufacturing in Canada.

Company Matters.

Baltimore, Md.—The Baltimore & Ohio Railroad Company has closed a contract with the Electric Storage Battery Company of Philadelphia for a storage battery to assist in hauling trains through the belt tunnel by electricity.

Boston, Mass—The Massachusetts Electric Companies stockholders have elected the following trustees to serve for three years: S. Endicott Peabody, Everett W. Burdett, E. Rollins Morse, Philip L. Saltonstall and Philip Dexter.

De Kalb, Ill.—The Sycamore & DeKalb Electric Railway Company, formerly of Sycamore, Ill., lately changed its name to the De Kalb County Light, Heat & Traction Company, located in this city. This company will now operate an electric light and power plant.

Plainfield, N. J.—In place of the steam cranes in use at the present time at the foundry department of the Pond Tool Works, modern electric ones are about to be substituted, together with other conveniences.

Power and Transmission.

Bristol, Tenn.—The Bristol Light & Power Company has been incorporated with $25,000 capital stock for the erection of an electric power plant in this place. B. L. Dulaney, Ed. K. Bachman, C. D. Caldwell, John H. Caldwell, of Bristol, and Col. E. J. Sanford of Knoxville, are the interested parties.

Automobiles.

New York City.—The Auto-Tool Company has been formed here with a capital of $600,000.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Nov 26						
United Traction	100	$5,000,000	$5,000,000	1½ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Nov 26						
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Nov 26:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Nov 26.						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.—Nov 26						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	[illegible]	[illegible]	[illegible]	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	[illegible]	[illegible]	[illegible],100,000	4 % S., Jan.	112	113
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156⅛	15[illegible]
Brooklyn N. Y.—Nov 26:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	230	232
Brooklyn Rap. Transit Co., tr certf..	100	48,000,000	48,000,000	....	75	75⅛
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Nov 26:						
Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.—Nov 26						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	90	91
Charleston, S. C.—Nov 26						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Nov 26						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	250	260
Chicago & South Side R. T. RR	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9½	10
Metropolitan West Side Elev. Ry	100	15,000,000	7,000,000	Feb 28 1900.	32	32⅛
Met. West Side El., pfd	100	15,000,000	9,000,000	....	84½	84¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	200	202
South Chicago City Railway	100	2,000,000	1,608,200	....	99	100
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	100	100½
Union Traction Ry.............com	....	1,250,000	624,900	35 %	13	13½
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	53	55
Cincinnati, Ohio.—Nov 26						
Cincinnati Inc. Plane Ry........com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry.........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
l Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124⅛	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Nov 26:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	100	100½
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Nov 26:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Nov 26:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.

incinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Nov 26						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	—
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	—
Holyoke Mass.—Nov 26						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Nov 26						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %,	150	—
Indianapolis, Ind—Nov 26.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	15	18
Lancaster, Pa.—Nov 26						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	—
Lancaster & Col. Electric Ry	....	....	87,500	....	--	—
West End Street Railway	....	....	....	....	--	—
Louisville, Ky.—Nov 26:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	82	83
Louisville Ry..................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Minneapolis, Minn.—Nov						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68⅛
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %, Oct,	186	137
Montreal, Canada.—Nov 26						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	273	275
Toronto Street Ry. Co	100	6,000.000	6,000,000	1¾ % S., J. & J. †	107½	108⅛
Memphis Tenn.—Nov 26:						
Memphis Street Railway Co	100	500,000	500,000	....	25	—
New Haven, Conn.—Nov 26:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	—
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Nov 26						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148⅛	153
New Orleans Traction Co new com.	100	....	....	....	22⅛	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR.............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20⅛	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Nov 26:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	173¾	174
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR..........guar.	100	800,000	800,000	....	198	201
k Sixth Avenue RR............guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	112	112⅛
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Nov 26:						
Consolidated Traction Co. of N. J	100	15,000,000	15,000,000	....	59½	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	28	28½
United Elec. Co. of New Jersey	100	504,000	504,000	11¾ % A.	16	21
Pittsburg, Pa.—Nov 26:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	26	26½
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	62	63
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	73
q Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry	25	1,500,000		1 %, Oct.	41	42⅛
Pittsburg & West End Ry	50	3,000,000		5 % A., June	..	..
United Traction Co...............com.	50	17,000,000		J. & J.	15	15¼
United Traction Co...............pref.	50	3,000,000		J. & J.	50¼	51

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Nov 26						
Union Street Railway Co.	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass.—Nov 26						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Nov 26;						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Nov 26;						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Nov 26;						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Nov 26						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	28	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000 000	29,930,450	....	36⅞	37
cElectric Traction Co.	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$8.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Nov 26						
Rochester Railway Co	100	5,000,000	5,000,000	....	15	17
Reading, Pa.—Nov 26						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	133	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis, Mo.—Nov 26						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	..	..
United Electric Ry....com.	50	500,000	500,000	....	20	21
United Electric Ry....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	83	84
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99.	--	--
San Francisco, Cal.—Nov						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	375,000	$2.50 share, '96.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—Nov 26						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
mScranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
mScranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Nov 26						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Nov 26						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Nov 26:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Nov 26:						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	§107½	108½
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	276¾	277
Washington, D. C.—Nov 26						
Belt Ry. Co	50	500,000	500,000	....	--	--
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Nov 26						
*Worcester Traction Co....com.	100	3,000,000	3,000,000	....	81¼	82½
Worcester Traction Co....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	100	101
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Nov 26:						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

ij Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 26						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	159	160
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	106	109½
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	128	129
New York.—Nov 26.						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	165	170
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		3	3⅛
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	84⅜	84⅝
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Nov 26:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co.	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	94½	95
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Nov 26						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	169⅞	170
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	28
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	51¾	52
Westinghouse El. & M'fg. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	63	64
Westinghouse El. & M'fg. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Nov 26						
Edison Elec. Ill'g Co., New York	100	9,138,000	7,938,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co......com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	169⅞	170
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,0 00	A. & O.	110	125
Pittsburg, Pa—Nov						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Nov 26						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	90	93
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	92	97
Northern Elec. Light & Power Co	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co	10	187,500	187,500	....	30	--
Miscellaneous.—Nov 26						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	350,000	......	....	165	165
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	93	93
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120¼
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q	‡201½	202
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	135	138
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Nov 26:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Nov 26:						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Nov 26						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	2⅜	2¾
United Gas Improvement Co..scrip.	50	10,000,000	......	----	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	----	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	44
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Nov 26:						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co	100	1,000,000	1,000,000	Q	190	192
Miscellaneous.—Nov 26						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	13	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	32	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co	100	....	....	----	105	108
*Pratt & Whitney Co..........com.	100	......	....	----	2	4
*Pratt & Whitney Co...........pfd	100	....	......	----	40	50
Stillwell-Bierce Co.............com.	--	....	....	----	--	50
Stillwell-Bierce Co..............pfd.	--	....	....	2 % Sept 1, '99.	50	65
Shultz Belting Co	100	500,000	....	....	89	90
St. Charles Car Co	--	....	....	......	80	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Albany N. Y.						
Date of Quotation—Nov 26, 1900						
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117⅛	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*116⅛	......
‖Watervleit Turnpike & RR.1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co....................1st 5s	....	....	1942	......	*116½	......
‡Interest guar. by Albany Ry. Co. ‖Principal and interest guar. by Albany Ry. Co.						
Baltimore Md.						
Date of Quotation—Nov 26, 1900						
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	113⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co.Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co.No. Balto div.1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust,1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......
☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.						
Boston Mass.						
Date of Quotation—Nov 26, 1900.						
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry........Deben. g. 5s.	3,000,000	3,000,000	1902	M.& N.	104⅛	106
West End Street Ry........Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....
†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.						
Charleston S. C.						
Date of Quotation—Nov 26, 1900.						
†Enterprise Street RR..........1st mtg. 5s.	500,000	47,000	1906	J. & J.	.. .	....
†Charleston City Ry...........1st mtg. 6s.	350,000	....	....	J. & J.	106	....
†Controlled by Charleston St. Ry. Co.						
Chicago Ill.						
Date of Quotation—Nov 26, 1900.						
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry....Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T....1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108⅛	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‖W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....
†Redeemable at option on 60 da. notice. ‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. ¶Subject to call after Oct. 1, 1899, at $110 and interest. ‖Assumed by W. Chi. RR. Co., lessee. §Int. guar. by W. Chicago St. RR. Co.						
Cincinnati, O.						
Date of Quotation—Nov 26, 1900.						
Cin. New. & Cov.St. Ry.1st Con.mtg. g.5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons.mtg.5s	581,090	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137
† Assumed by the Cincin. St. Ry. Co. ‖$250,000 reserved to retire 1st mtg. bds.						
Cleveland O.						
Date of Quotation—Nov 26, 1900						
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114¼
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry.Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR............1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry.1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....
†$1,900,000 in escrow to retire bonds of absorbed companies, marked a. ‡Interest guar. by Cons. St. Ry. Co.						
Detroit, Mich.						
Date of Quotation—Nov 26 1900.						
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,385,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry....1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½
†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.						
New Haven Conn.						
Date of Quotation—Nov 26, 1900						
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven(Edgewood Div.)1st.mtg.5s	250,000	250,000	1914	J & D	111	.....
Winchester Avenue RR—1st mtg. g. 5s	100,000	300,000	1912	M& N	109	......
Winchester Avenue RR......Deben. g. 5	100,000	24,000	1912	M& S	......	....

*With interest. °Unlisted.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Orleans La.						
Date of Quotation—Nov 26, 1900.						
Canal & Claiborne RR.....cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR.2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co.......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......
†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. ‡$90,000 outstanding.						
New York.						
Date of Quotation—Nov 26, 1900.						
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn).1st gen. mtg.5s.	759,000	759,000	1909	M. & S.	107⅛	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave.1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn,Bath & W.E. RR.Gen.mtg.5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109⅛	......
Bleecker St.& Fult'n Fer'y RR.1st mtg.7s	700,000	700,000	1900	....	98⅛	100⅛
Cent P'k, N. & E. R. RR.1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR.1st mtg.5s	300,000	300,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen.mtg.g.5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	..
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR.1st mtg. g.5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	300,000	300,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	350,000	350,000	1919	....	110⅛	112⅛
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry......1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR....1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114
†$1,085,000 in escrow to retire gen. mtg. bonds. ‡$4,850,000 in escrow to retire maturing obligations. ¶$552,000 in escrow to retire 1st and 2d mtg. bonds. §In treasury, $80,000. ‡‡ Guar. by Union Ry. Co.						
Toronto Canada.						
Date of Quotation—Nov 26, 1900						
Montreal St. Ry........................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	.
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.	....	.
†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.						
Philadelphia.						
Date of Quotation—Nov 26, 1900.						
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	..
Empire Pass. Ry......................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	..
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	...
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry...................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	....	1943	... .	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry..............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co...............Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	....	1905	....	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......
§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.						
Pittsburg, Pa.						
Date of Quotation—Nov 26 1900						
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co...............1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	...
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	118
Pittsburg & West End..........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	.....
Second Ave. Traction Co.....................5s.	2,500,000	2,000,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1919	M. & S.	......	....
Providence R. I.						
Date of Quotation—Nov 26, 1900.						
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118
St. Louis.						
Date of Quotation—Nov 26, 1900.						
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101⅛	102¼
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101⅛	102⅛
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J& J	17	

*With interest

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PASSENGER RAILWAY.

St. Louis.

Date of Quotation— Nov 26, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co.....................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co...............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co.....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co.................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation— Nov 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry......1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	3,000,000	3,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co...................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation— Nov 26 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co........................O. ne mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry...........................'s mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. '' mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

Miscellaneous.

Date of Quotation— Nov 26, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co.........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
¶Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,866,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	...
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry.........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	3,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$960,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

Boston, Mass.

Date of Quotation—Nov 26 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	....		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation—Nov 26, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......

I Miscellaneous.—(Nov 6, 1900.)

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn)........	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	....	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	3,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	.....	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation—Nov 26 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Bell Telephone.......................4s.			1908	F. & A.	100½	101
NorthwesternTelegraph Co..................7s.	....	......	....	......	....	......
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co... 5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—Nov 26, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating.............7s	500,000	500,000	....	....	....	......
Armington & Sims Engine Co..............	....	....	......	......	......	25
...rney & Smith Car Co........................6s.	....	....	1942	J. & J.	106	107
Barberundum Mfg Co..........................6s.	....	....	1904	J & D.	......	......
Cworthington Pump Co......................	75,000	....	......	....	115	127

W Unlisted †Nominal

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The capital stock of the Marietta (O.) Electric Company has been raised to $250,000.

The Plattsburg (N. Y.) Traction Company shows a net income of $2,974, in its last quarterly report.

The London County Council has decided to take steps to institute a service of electric cars throughout the English metropolis.

Contrary to general opinion very few General Electric debenture 5 per cent. bonds have been exchanged for common stock.

Westinghouse Electric recently crossed par again, and is now selling at nearly the highest point on record on the Pittsburg stock Exchange.

The New Rochelle & Westchester Telephone Company has moved its principal office from New Rochelle, N. Y., to New York City.

The "Journal of Commerce" gives the December dividend payments of industrial companies as $50,689,490, with several important payments still to be heard from.

Prominent capitalists of Toledo, O., will build an electric road from there to Defiance, going through six towns. Almost all of the right of way has been obtained.

The American District Telegraph Company, of Brooklyn, N. Y., has declared a dividend of 3 per cent., payable December 10. Books close December 3 and re-open December 11.

The notice of the New York Stock Exchange in respect to the admission of the Amalgamated Copper Company to its unlisted department states that the capital is $75,000,000, all of which is outstanding.

In Philadelphia financial circles it is believed that the recent unusual activity in Philadelphia Electric, Union Traction and United Gas stocks suggests a deal or combination of some kind involving these important properties.

The directors of the London and River Plate Bank, Limited, London, have declared a dividend of twenty per cent. to the shareholders for the year ending on September 30 last. In addition to this the sum of $200,000 is carried forward to new account.

The London Metropolitan Underground Railway Company will open bids December 1 for the work of equipping it with electric motive power. The Thomson-Houston and the Westinghouse companies are bidding and there are a considerable number of British bids.

A Brooklyn Rapid Transit stockholder says: "I feel sure that Metropolitan interests have acquired considerable Brooklyn Rapid Transit stock. There is a growing scarcity of the stock in the Street, and the time is not far distant when none can be had at anywhere near the present price level."

The Illinois State Board of Equalization is expected to impose a net assessed valuation of $1,000,000 on the Chicago Union Traction Company and consolidated companies; $600,000 on the Chicago City Railway; $50,000 on the Chicago Telephone Company, and $100,000 on the Chicago Edison Company.

A mortgage for $80,000 in favor of the John A. Roebling Company of New York against the Mississippi Valley Telephone Company has been filed with the register of deeds at Minneapolis. Minn. A statement of total liabilities that accompanies the document places the company's indebtedness at $97,000.

The shareholders of the Wisconsin Telephone Company, a branch of the Erie Telephone Company, held a meeting on November 26 and increased the capital stock of the company from $3,000,000 to $5,000,000. Of the $2,000,000 increase $1,000,000 will be expended on the underground system of Milwaukee.

The copper market is steady, and what changes there are in quotations are in favor of the producer rather than of the consumer, and yet consumption is not visibly restricted. The largest producers of copper, and consequently those best qualified to judge of future conditions, say they expect the indefinite continuance of a 17 cent price.

The directors of the Cambridge (Mass.) Electric Light Company offer to stockholders for subscription the 2,000 shares of stock, recently authorized by the gas commissioners', at $120 a share. Stockholders are entitled to the right to subscribe for four-fifths of the share of new stock for each share now held. Subscriptions will not be accepted for fractions of shares. The company will not buy or sell rights.

A report from Boston says that of the $5,298,000 General Electric 5 per cent. debenture bonds outstanding at the time the stockholders authorized an increase of stock by $4,415,000, with which to retire these bonds, it is estimated that $3,000,000 will be exchanged for stock, on the basis of one share of common stock for each $120 represented, by the principal of the bond at the time of such redemption. About $2,000,000 of the bonds, it is expected, will not be exchanged as this amount is held by trustees who paid less than par for them, and they are content to allow the investment to remain undisturbed.

The stockholders of the Port Chester (N. Y.) Street Railroad Company have filed their consent in the Register's office of Westchester County to mortgage the property of the company to the New York Security and Trust Company of New York City, as trustee, for the sum of $200,000 as security for the payment of $200,000, in bonds to be issued by the Port Chester Street Railroad Company. The bonds are to be payable in thirty years and bear 4 per cent. interest. The company has a capital stock of $300,000. The new issue of bonds is for the purpose of improving the property and extending the lines of the company in the towns of Rye and Harrrison.

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ELECTRICITY.

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As Electricity reaches all classes interested in electrical work, its value as an advertising medium can be readily understood. Rates will be sent on application.

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THE TRADE SUPPLIED BY
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EDITORIAL NOTES.

Is the Problem of Aerial Navigation Solved?

Opinions seem to be divided as to whether the problem of aerial navigation has been solved. Count Zeppelin, who, as is generally known, has been experimenting with his cigar-shaped navigable balloon near Friedrichshäfen in Germany, claims that it has, while many others, the Duke of Argyle among them, assert that the tests made by the German inventor signify little or nothing.

Immense sums of money have been spent during the past one hundred years by enthusiastic inventors in trying to devise a body that would travel through space as a ship travels through the sea. It was early ascertained that the principal difficulty did not lie in lifting the mechanism from the surface of the earth, but in directing its course when suspended in the air. When the aeroplane was tried, the weight of the necessary machinery to guide and propel it against a moderate breeze, made it impracticable, while with the balloon the necessary weight could be raised, but the apparatus was too bulky to be driven or guided against the wind—at least until Count Zeppelin conceived the idea of a cigar-shaped balloon ship.

In the experiments that have been made in this line electricity has played an important part, many believing that when the use of the electric current became perfected, the problem of what might be termed aerial propulsion would be easy of solution. Such proved, however, not to be the case, for the same reason that ocean going steamers are not electrically driven—namely, that the power derived was too small for the weight which it was necessary to carry.

By the use of benzine motors, exploded by electric sparks, Count Zeppelin has succeeded in propelling his 420 foot balloon ship against a moderate breeze and has also succeeded in making it perform evolutions, such as turning in a circle, twisting, rising and falling. In a recent trial the airship traveled six miles with the wind, which was blowing about ten miles an hour, and then turned and without rising or falling from the stratum of air in which it was in, came back at a fair rate against the breeze. Count Zeppelin, as previously stated, considers the problem of aerial navigation solved, and expressed a belief that with a few improvements his ship will be capable of a speed of thirty miles an hour. On the other hand the Duke of Argyle, who is an authority, is reported as saying:

"I do not think that man can overcome the natural laws that condemn all buoyant bodies to an inertia that makes them useless. They must go with the medium in which they float. They cannot resist it, seeing they have no fulcrum to act on. . . . My own belief is, that if we are ever to navigate the air it must be on the mechanical principles which nature has adopted in her glorious and exquisite mechanism of avian flight."

This may possibly be so, but it cannot be gainsaid that Count Zeppelin has succeeded in driving and guiding his ship against the wind, a thing heretofore deemed well nigh impossible. We navigate the sea, and yet our ships are not propelled after the plan of fishes, and there would therefore seem to be no reason why we should not some day travel through space in the manner suggested by the German Count.

* * *

Telegraphs and Telephones at the Paris Exposition.

Mr. John Gavey, the engineer-in-chief at the General Post Office, London, has reviewed the principal telegraphic and telephonic exhibits at Paris in a paper with the above title, which was read before the Institution of Electrical Engineers on November 22. The Exhibition catalogue included in Class 26 "Telegraphs, Telephones and Phonographs," and Mr. Gavey dealt with the subdivisions in this order, but only dwelt on those which showed considerable novelty, or which illustrated the progress made during the last decade, this course being preferable to attempting an exhaustive description of the class as a whole. There were three distinct systems of telegraphy deserving special attention, each "exhibiting considerable merit from the scientific point of view, although possibly they may be unequal from the practical standpoint." They are designed either with a view of increasing the amount of traffic which can be carried by a telegraphic circuit, or of abolishing the transcription at the receiving instruments necessary with Morse methods; but they are based on different principles.

Rowland's multiplex system, exhibited at work by the Rowland Telegraphic Company of Baltimore, Md., was an apparatus admitting

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of eight messages being sent simultaneously, four in each direction. The apparatus was stated at Paris to have given satisfactory results over 600 miles of actual line in America.

Mercardier's multiple system, exhibited by M. Ernest Mercardier of Paris, was said to transmit 24 messages simultaneously over one circuit, 12 in eaeh direction. It is based on the harmonic system of telegraphy, one form of which was devised years ago by Elisha Gray. Mercardier's method, however, is not a copy of Gray's, as by the use of telephone receivers and transmitters combined in various ways, he has designed an absolutely independent method. As transmitters, Mercardier uses electrical vibrating reeds of a well-known character, and as receivers he uses a combination of a telephone and a microphone, the latter sending out a powerful series of undulations into the local circuit, these undulations being selected by suitably designed telephones, which only respond to the vibrations to which they are tuned. The method, therefore, is a Morse method pure and simple, in which, so far as the operating is concerned, the telegrapher uses a Morse key for signaling, and the receiving telegrapher uses telephones as sounders. Mr. Gavey learned at Paris that the Mercardier apparatus had, in the course of recent trials, worked satisfactorily between Paris and Bordeaux, but it required a metallic loop for thoroughly satisfactory working.

The third system was that of Messrs. Virag and Pollak, whose photo-autographic telegraphic apparatus was shown in the Hungarian section.

The author then turned his attention to the telephone section of the subject. He found that the advance in telephonic practice has, on the whole, been greater than in the branch of telegraphs devoted to the transmission of public messages. The invention and perfection of the manufacture of dry-core paper insulated cables has resulted in the more important of the telephonic administrations, both in the Old and New Worlds, undertaking the substitution of metallic for earth circuits for telephonic intercommunication. With the means at their command at an earlier period telephonic engineers were practically restricted to overhead work at their large exchanges, and although they all realized the disadvantage of earth circuits, few of them could face with equanimity the doubling of the huge number of overhead wires necessary for metallic loops. Now a dry core cable which will serve 200 subscribers may be drawn into a 3-inch pipe, and in the course of a few short years an earth circuit telephone will be a thing of the past. Not only has this improved the subscriber's circuit, but it has led to the introduction of improved telephones and improved switching arrangements, also to enlarging the number of subscribers connected to the central switches, which has brought about improved methods of automatic signaling.

Mr. Gavey proceeded to refer to the exhibit of the Western Electric Company, illustrating the central battery telephone switch, a system which is being rapidly extended throughout the whole of the United States, has been adopted by the British Post Office in London, by the National Telephone Company in some of its centers, and by the Belgian administration in Brussels.

Mr. Gavey had on the lecture table a set of Postel-Vinay switches which have been recently introduced at the newest of the Paris exchanges at the Avenue Breteuil. Their most striking feature is their remarkably small and well-designed automatic indicator, which can be placed immediately over the jack for working the junction circuits. Mr. Gavey expressed the opinion that signaling lamps are on the whole preferable to electro-magnetic indicators.

In wireless telegraphy there were four exhibits, viz.: (a) An illustration, by means of coils, of the Post Office electro-magnetic method originated by Sir William Preece; (b) M. Ducretet's Hertzian system, which is understood to have been designed by him in conjunction with M. Popoff, the Russian inventor, and which has been adopted in the French and Dutch navies; (c) the Slaby and D'Arco system of the Allegemeine Elektricitäts Gesellschaft, Berlin; (d) the Poulsen microphonograph. The "Telephone Hirmondo," which provides news and musical transmission alone, but without telephone intercommunication, in the city of Buda-Pesth, was also briefly referred to.

* * *

Street Railway Mergers. During the past week there have been several large transactions in street railroad lines, notably the one in New Jersey, where the trolley roads in Elizabeth, Rahway and Plainfield were consolidated with $3,000,000 capital. The concentration of electric railways under one control naturally creates a stir in financial circles, but the New York "Financier" says there is nothing especially new in this as street railway absorption has been going on for some years, resulting in corporations like the Metropolitan system, the Brooklyn Rapid Transit system, and others of almost similar magnitude. More than one banking house in New York can trace the foundation of its wealth to street railway consolidations, and as the business offers almost limitless possibilities, there is no question that great profits will be made in the future. Up to now the process of merger has been applied to systems in prominent cities only, but as these have been for the most part pre-empted, attention is being turned to smaller centers. When it is recalled that there is scarcely a city of 5,000 population in the United States without its electric railway, and that in many places ranging from 10,000 upward, two and more independent lines are found in operation, the opportunity, it will be conceded, is an attractive one to the street railway specialist. In many instances towns lie so closely together that a central plant is capable of furnishing both with power, and for that matter with electricity for public and private use. The operation of small plants, as generally conducted, is wasteful in the extreme. Not only that, but the service to the public is limited, and by reason of lack of transfers, costly to both interests. The street railway specialist in his work of eliminating the expenses and inviting larger revenue through better service at more frequent intervals over a longer distance, performs a real service, both to the shareholders and the community in which he is working. If he can increase gross profits from one fourth to one-half, at the same time effecting an actual economy in operating expenses, he is fully entitled to all the pay he receives in the shape of new stock or cash. The community has no reason to complain, for in every instance it gets better service, longer rides and quicker transit. The secret of success in American manufacturing industry is the ability to produce cheaply by employing the best and highest paid labor in the world. The same rule holds true in street railway and public enterprises of like character, for economy in operation, on the standard of most efficient service, yields dividends. It would be impossible, naturally, to say how many hundreds of thousands, or millions of dollars are being wasted annually in this country through unnecessary duplication of expense in street railway operation, but the total is a heavy one. The men who are engaged in reducing this waste deserve success. The field is one that appeals particularly to young men who have acquired a thorough and technical education in electricity.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The American Society of Mechanical Engineers is now holding its meeting in this city at 12 West 31st street. The convention will adjourn on Friday, December 7.

There is considerable talk in England regarding the adoption of Marconi's system of wireless telegraphy by the Post Office, or, in other words, the Government. The principal stumbling block is the price to be paid for the use of the system by the authorities.

The Lehigh Valley Railroad is extending its system of electric automatic switches to its entire main line and the principal branches.

Our London correspondent informs us that the British Westinghouse Electric & Manufacturing Company, Ltd., is to bring a bill before the next Parliament enabling it to undertake the electrical equipment of the Metropolitan and the Metropolitan District Railways and to suspend the running power of the other railways (operated by steam locomotives), which make use of the underground tracks, during the time occupied in effecting the conversion from steam to electrical working.

An inquiry for what it is claimed will constitute nearly $100,000 worth of electrical machinery has been received from Italy by an engineering firm in this city. A cable reply is requested specifying the earliest delivery possible. Upwards of $50,000 of such machinery has been sent from this port to Genoa recently. Italy is one of the most advanced electrical engineering countries of Europe.

The Illinois Central is planning a change in the equipment of its suburban lines in Chicago from steam to electricity, and a large portion of the $6,000,000 which will be spent in improvements will probably be used for this purpose. The road recently increased its capital stock by this amount, and the report was current lately that this change in motive power was to be established at an early date.

Reports to the chief signal officer from Manila indicate that the War Department has made an important discovery in connection with submarine cable work in tropical waters. One of the War Department cables that was shipped to Manila, and put down for interisland communication, happened to be of the rubber insulated variety. The English cable experts

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in the islands predicted its speedy destruction by the toredo, a submarine boring worm which eats everything short of railroad iron which may be submerged in the water. The English cable, with gutta percha insulation, resists the attack of this insect for only about a year, and it is necessary to insert in the cable armor a thin continuous wrapper of sheet copper to prevent the toredo from boring clear through to the conducting wires and short-circuiting the cable. This copper protection adds considerably to the expense of the cable, without adding to its efficiency for telegraphic purposes. It seems, however, that the American cable, with its rubber insulation, which has been down for two years, is still in good working order, an important argument in favor of the use of rubber over gutta percha, aside from the fact that rubber is the cheaper insulation of the two. Colonel Allen, chief signal officer in the islands, has advised General Greely that the cable staff of the signal service is at present organized on a very effective footing, and will be able to lay practically any amount of cable the department may see fit to ship to Manila.

SIGNOR MARCONI, according to a recent report, has practically solved the question of ocean transmission by wireless telegraphy, and will soon be able to use his system across the Atlantic.

F. D. PEARNE, who has been working for the Iowa Telephone Company in Le Mars, Ia., is the patentee of a telegraph typewriter from which great results are expected. The machine, it is claimed, will enable a man to write on a typewriter connected with telegraph wires in an office in one city and reproduce almost instantaneously the matter in copy in an office at another point.

PROGRESS on the New Hamilton Otto Coke Company's plant north of Hamilton, O., has been so rapid that it is now practically certain that the company will be making coke by the middle of January. An interesting feature of the new plant is its power apparatus. All of its hoisting and coke smoking machinery will be driven by electricity, furnished by the company's own plant; motors aggregating 300 horse-power are already being installed.

THE Governor of the island of Crete, in the Mediterranean, is inviting bids for quite a number of railway bridges. Since Prince George of Greece has been appointed Governor of Crete the country has made progress in every respect. Canea, the capital, is now to be lighted by electricity.

A CORPORATION has been formed in this State to run coaching parties to and from Long Island towns in automobile drags and a trial trip of a nine seated vehicle will soon be made. Electricity will be the means of locomotion. The American Bicycle Company, 941 Eighth avenue, New York City, will supply the automobiles, but R. M. Barwise, the manager, refused to give the name of the new company or its capitalization.

A STOCK-YARD firm in Chicago runs a miniature electric trolley system, which is used to haul meats to the various departments of the packing house. The line is complete in every detail, with overhead wires, trolley cars, trailers, switches, curves, and all the other things that go to make up a trolley system. It is built upon the broad gangway, fifteen feet from the ground, which connects the second floors of several of Armour's big buildings at the stock-yards, so it is really an elevated road, the smallest in the city. The motor cars with a little trolley pole jutting up to the wire are just big enough to contain the controller box and the motorman, and the trailers in which the meat is hauled are open boxes of steel similar to the old-fashioned trucks which were propelled by hand. They are attached to the motor with little coupling pins. The tracks have switches at the proper points to divert the little trains to one building or another as may be desired.

THE town of Boulder, in the new gold fields of West Australia, was recently equipped with generating sets for lighting and power purposes and electric motors for operating hoists, etc., in the mines.

THE electrical development at Ottawa, Canada, although of comparatively recent date, has been most rapid. In 1887, the Chaudiere Electric Light & Power Company was organized and was practically the beginning of the large system which now supplies Ottawa and Hull with electricity for lighting and power. The first dynamo had a capacity of 250 incandescent lights. The dynamos to be installed in the new power house of the Ottawa Electric Company now under construction, have a capacity of 15,000 lights each. In 1895, an amalgamation of the Chaudiere, the Standard and the Ottawa Companies was effected, under the name of the Ottawa Electric Company, whose business has developed enormously until to-day it has installed 700 arc lights and about 100,000 incandescent lights, being a larger number, per capita, than any other city in the world. The history of the Ottawa Electric Street Railway Company is very modern, but its growth has not been less remarkable than that of the lighting interests of the city. Only ten years ago the gross annual receipts of the horse railway company of Ottawa were $27,000, and the number of passengers carried in a year were 65,000. The receipts of the Ottawa Electric Railway Company this year, will be over $300,000, and the number of passengers carried will exceed 8,000,000. This electric railway began its operation with about ten miles of track, and to-day it has forty-two miles.

CONSUL-GENERAL PATTERSON, at Calcutta, India, says in a report to the State Department at Washington, D. C., that the Calcutta Tramway Company, Ltd., is preparing to change its lines from horse power to electricity and the contract for the power station, has been given to Messrs. Dick, Kerr & Co., Ltd., of London. The first shipments for the plant are expected to arrive this month. Mr. Patterson says: "I have answered many letters from our various electrical companies relative to the use of electricity here, calling their attention to the proposed change in the tramway company's lines, and believe that, with proper efforts on their part, the contract might have been secured, as Americans are now competing successfully with the English companies even in London. Electricity is now beginning to be extensively used in Calcutta for various purposes, such as lighting, fans to take the place of punkas that were pulled by coolies, for driving machinery, etc., and there is an opening here for the sale of electrical machinery and goods, which our manufacturers should take advantage of. I would advise correspondence with Messrs. Kilburn & Co., here, who have an electrical plant and are furnishing electricity and electrical machinery and goods; also, with the following named firms in Calcutta, who are dealers in such machinery and goods, viz.: Osler & Co., Octavius Steel & Co., and the Calcutta General Electrical Company. All machinery is now entered duty free in India, but there is a duty of 5 per cent. ad valorem on goods. There is a direct line of steamships between New York and Calcutta, but a cheaper freight on machinery and goods not required for immediate use would be by sailing vessels via the Cape."

IT is now stated that the recent Tarrant fire in this city was not of an electrical origin. That such would prove to be the case has been our opinion all along. People are too prone to ttribute every fire that breaks out to defective insulation in an electric light or power wire.

THE first annual meeting of the Illinois State Electrical Association was held in Champaign last week. There was a large attendance and a number of interesting papers were read.

OF recent years nearly every town is provided with an electric generating plant and frequently the wires are strung along country roads from town to town. This fact has led a man named McNair to attempt the use of electricity on the farm. He has devised a curious pen some 15 feet square, built of wire and mounted on broad, flat wheels. This pen is designed to run in any pasture, even though it be hilly. Wires connect it with a small motor stationed at one side of the pasture, this in turn being connected with the electric wires from which power is derived. A turn of the button and the pen slowly creeps across the field. That is the essence of the invention, and simple enough it seems. A machine of this type is being experimented with at the Agricultural Experiment Station of Michigan, at Lansing. Two lambs and part of the time an old ewe have been pastured in the pen during the summer. The field is planted with lucerne, growing thick and heavy. The pen is so arranged that it crawls the full length of the pasture in one month, traveling about two feet an hour; at the end of this time it is switched around and travels back again. As it moves the sheep eat every bit of the fodder, eagerly cropping next the forward side of the pen as it runs over new ground. A bit of canvas duck is hung over the corner of the pen so that the sheep may be well sheltered, and curious as it may seem, they have become so accustomed to the moving of the pen that when they lie down to sleep they snuggle up close to the forward end of the pen so that they may lie as long as possible without being disturbed by the rear end of the pen as it creeps toward them. When the pen has passed, of course, the lucerne that has been cropped by the sheep immediately grows up again and by the time the pen has made its monthly circuit the pasture is again in good condition. The advantages of this electrical pen lie in the fact that the sheep are kept from running over, half eating and tramping down a large amount of pasture, and it keeps the sheep quiet, so that they lay on flesh rapidly.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 4.

PRIMARY BATTERIES.

Current Produced by Chemical Action.—Any combination of metals or substances acted upon by acids so that the chemical action will produce electrical action may be called a primary battery,

When wood is burned the carbon of the burning material combines with the oxygen of the air, and heat is given out as a result of the chemical combination, which we call combustion. In a similar manner if a piece of zinc be placed in some sulphuric acid, the acid combines with the zinc and as a result of the chemical combination heat is given off. Of course heat represents a certain energy or capacity of doing work. It has been discovered that under certain conditions the energy in this manner represented by chemical action is productive of electrical action, and taking advantage of this we get electric batteries.

When two different metals are placed so they do not touch each other and immersed in a liquid which will attack them chemically, one of these plates will become a positive pole and the other negative, to a current of electricity that will be produced by the chemical action and be caused to flow over a circuit which is connected to the exposed ends of the plate. A jar or vessel containing two plates thus immersed in a solution of acid or acidulated water is called an electric battery cell, and the plates are called the electrodes of the cell. It is customary to speak of the electrode from which the current is flowing as the positive pole and the other electrode is known as the negative pole, the difference of electrical pressure between the two elements is known as the electro motive force or voltage of the battery, that is, the current will leave the positive pole at a certain pressure or force, consequently will have the power of doing work in a circuit which is connected to the two plates of the cell. The current of electricity produced in this way not only flows from the positive plate to the negative plate through a circuit, but also flows within the cell itself from the negative plate to the positive one, consequently the negative plate will be known as the positive element of the battery while the positive pole is known as the negative element. We might illustrate the action of an electric battery cell by saying that the cell performs the same function to the electric energy set in motion, as a pump would that had its discharge pipe connected to the point where the water is taken in, to the flow of water in the pipe. Now if the pump be set in motion it will force the water to circulate through the pipe and also within itself, the pump acting as the motive power of the circuit. Just so in a battery, electrical action is produced by the cell and the chemical action is the motive power of the circuit.

There are a large number of different styles of cells used and the combination of elements are as varied. We will not attempt to describe or explain very many of these, but will take up in detail a few of those most commonly known and used, so that the reader may get a general knowledge which will be of value to him in the care, use and purposes of them. The strength and direction of the difference of electrical pressure between the poles of a cell depend upon the material used for the plates and the nature of the liquid. Take for an example, if copper and zinc be used as the plates and sulphuric acid as the liquid the electromotive force or pressure produced will not be quite a volt and the copper plate will be the positive pole of the cell. In a battery of this description a vigorous chemical action will go on at first but will gradually decrease in intensity and finally will appear to stop entirely. This may be plainly shown by having the current do some work, for instance, if an electric bell were placed in the circuit it would ring very loudly when first connected, but would soon weaken and after a short time would cease to ring altogether; if we then examine the plates a layer of bubbles will be found covering the surface of the copper, these bubbles are composed of hydrogen gas which is generated by the chemical action that was going on in the cell. The effect of this condition is twofold. In the first place the existence of these hydrogen bubbles causes a counter or opposing electric pressure in the battery opposite in direction to that of the regular action of the cell and thus the effective pressure of the cell is reduced. This layer of bubbles also presents a high resistance to the flow of current, for you remember we said that the current flows within the cell as well as in the circuit to which it is connected. A battery that is made inactive by the above condition is said to be polarized and the effect is called polarization.

In order that a battery may be capable of doing efficient continuous work some way must be devised to keep it from polarizing, or in other words keep it depolarized. This can be accomplished in any one of three different ways. First, by mechanical action. Second, by absorbing the hydrogen by chemical action. Third, by electro-chemical means whereby the hydrogen condition will be exchanged for a metal which will be deposited upon the positive plate.

The method of depolarizing by mechanical means is that the hydrogen bubbles be cleared from the positive plate as rapidly as they are deposited upon it. This can be accomplished by blowing air into the liquid or continually stirring it, which method however is not practical. If the surface of the plate be roughened the bubbles will not adhere so closely and a great many of them will come to the surface and vanish. This idea was used some time ago to accomplish this purpose, but was not very successful and has since been replaced by more modern and practical methods.

In the second way of absorbing the hydrogen, a substance can be added to the liquid which will combine with the hydrogen as rapidly as it forms and polarization prevented. A number of substances can be used for this purpose but the ones most commonly employed are bichromate of potash, dioxide of manganese and nitric acid. A battery that we may use as an example of this condition is the one commonly known as the bichromate cell. It is a carbon and zinc battery the liquid of which is composed of sulphuric acid which has dissolved in it bichromate of potash. When chemical action is going on in this cell the polarization is prevented by the direct combination of the hydrogen which forms with the bichromate of potash. Copper is not used for the positive plate in this style of cell, but is replaced by carbon, because bichromate of potash will attack and destroy copper; this battery is sometimes known as a "plunge battery" because the zinc is not allowed to remain in the cell for the liquid acts continually upon it and eats it up.

In the well known Leclanché battery, dioxide of manganese is used to produce the depolarizing effect and is generally broken up into small pieces and placed in a porous cup with the positive plate or carbon. Sal-ammoniac dissolved in water is used as the liquid in this style of battery and a zinc pencil as the negative pole. Sometimes the dioxide of manganese is powdered and mixed with some adhesive liquid such as shellac for instance and then formed into bricks which are placed on each side of the carbon element secured to it by rubber bands. This you will recognize at once as the well known and familiar "prism" battery.

These cells just described are known as open circuit batteries, by that we mean cells which it would not do to have working continuously and are only for such purposes as ringing door bells, electric gas lighting, etc.

If we require a continuous current, such as for telegraph use, a style of cell is used that is known as a closed circuit battery, that is, one in which the circuit may be continually in operation. A battery of this type is the "gravity" cell.

To set up such a cell copper plates are placed in the bottom of the jar and then covered with sulphate of copper, often called blue stone, the jar is then filled with water and a zinc suspended from the side of it so that it will remain near the surface of the solution although covered by it. When hydrogen gas is generated in a cell of this description it will travel toward the copper, and combine with the copper sulphate solution separating copper from it, and depositing it upon the copper plate, which will consequently be kept clean and in good working condition. This is an example of the third method of depolarization whereby the hydrogen is practically exchanged for a metal which is deposited upon the positive pole. The name "gravity" is given to this cell because the copper sulphate solution remains at the bottom of the jar while the zinc sulphate formed by the action of the cell will be at the top, whereas gravity keeps the copper sulphate solution at the bottom of the cell because it is much denser and of greater weight. To start one of these cells in action rapidly a small amount of diluted sulphuric acid may be poured in it to more readily start the chemical action.

Some chemical action by which zinc is wasted goes on in nearly all battery cells when the circuit is open. This can also occur when the cell is being used for producing electrical energy without adding to or helping the action which produces the electro-motive force of the battery. Chemical action of this nature is called local action. It is very often caused by metallic impurities in the positive element or zinc, which forms with the pure zinc little individual electric batteries, the action of which causes the zinc to be eaten away in spots. Another condition which may also cause local action is a difference in the density of the liquid in the cell. An example of this is often noticed where the zinc may be almost eaten apart near the top of the solution while the lower end of it may still remain near its original size.

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If the surface of the zinc be amalgamated by dipping it in a dilute acid and then rubbing it with mercury the impurities in it will be covered while the pure zinc will be brought to the surface in a sort of paste form caused by its combining with the mercury. This will to a great extent prevent local action or a waste of energy.

Article No. 5 will be entitled Secondary or Storage Batteries.

ANSWERS TO QUESTIONS OF LESSON NO. 3.

First—5 ohms.

Second—100 volts.

Third—5 amperes.

Fourth—55,000 watts. Between 73 and 74 hp.

THE OUGRIMOFF "ELECTRIC CALORIFACTOR."

Translated from "L'Electricien," Paris, for ELECTRICITY.

Mr. Ougrimoff, a professor in the Imperial Polytechnic School of Moscow, Russia, exhibited a curious apparatus at the Paris Exposition, which he calls an "Electric Calorifactor." It is a kind of steam generator in which the necessrry heat for vaporizing water is produced by an electric arc which advantageously replaces fuel.

This heater is a remarkable invention on account of its simplicity and its many uses, for it is capable of many applications, especially in factories supplied with electricity generated from water power.

It is generally known that sugar refineries, distilleries, chemical works, and other concerns using electricity as a motive power, are often obliged to install steam boilers to meet the various requirements of heating. In such places an electric steam generator may be very useful, especially when the price of electric energy is extremely cheap, as is the case in shops supplied with current from water power.

The Ougrimoff heater employes a powerful electric arc enclosed in a tube to transform electric energy into heat. It requires little space, as furnace, flues and chimney are replaced by a very simple tube.

As may be seen in Fig. 1, which shows the apparatus in vertical section, the heater is in the form of a vertical cylinder furnished with a closed cast tube extending through the center, in which is formed an electric arc between a carbon, electrode B, and powdered graphite which fills the bottom of the cast metal receptacle C and seals the lower portion of the heating tube. The arc is wholly enclosed to prevent the admission of air when the heater is in operation. This arc requires from 60 to 100 volts.

The upper portion of the tube is closed by a solid cover A, through which a screw carrying the carbon holder penetrates and which is electrically insulated from the main body of the heater by a suitable packing.

Powdered graphite is employed as a negative electrode for the double purpose of protecting the metal portion of the tube against the very high temperature produced by the arc and also to serve as a durable resistance when the heater is in operation.

The resistance of the powdered graphite when cold, is sufficient to prevent a short circuit when the two electrodes are brought together in starting the arc, and its resistance gradually decreases as the temperature increases.

The negative wire is attached to the body of the heater, and the carbon rod B is the positive pole. This disposition is necessary to obtain good results and keep the powdered graphite scattered or spread over a large space and thus protect the inner side of the tube and also to give sufficient resistance at the time of starting the arc. While the arc is burning additions are constantly being made to the cup of powdered graphite C from the positive electrode B. With an arc of 60 amperes at a pressure of from 60 to 80 volts, the quantity of powdered graphite deposited is about two grains per hour; a quantity quite sufficient to compensate for the loss due to combustion in the arc of the graphite forming the negative pole.

The arc does not require any great precision in regulation during its operation. What little adjustment is necessary can be done by hand or by an automatic arrangement.

When the apparatus is first started the gas contained in the tube becomes warm and expands.

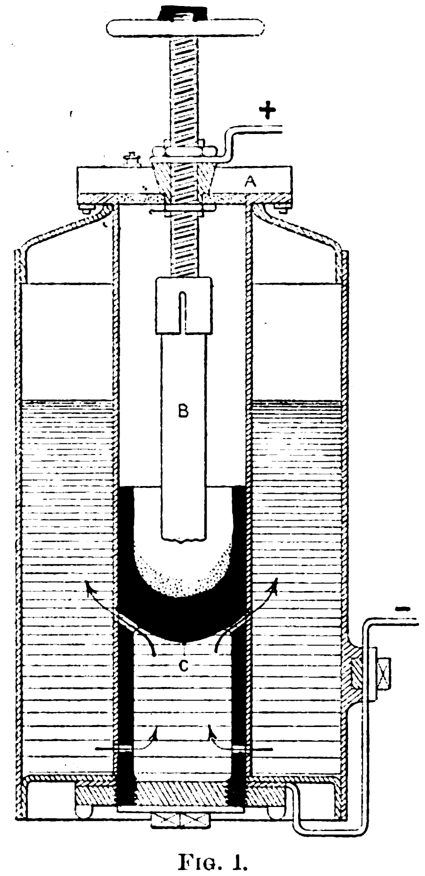

Fig. 1.
Vertical Section of Ougrimoff's Electric Heater.

Means are provided to allow of its escape through a small valve placed in the insulating material of the cover and so arranged as to prevent outside air from entering.

The heater exhibited at the Paris Exposition was 40 cm. high, 18 cm. in diameter, and consumed from 6 to 10 kw. per hour (100 amperes at 60-100ths volts). It furnished steam at a pressure of 7 kw. per square centimeter, with an efficiency of 98 per cent.

A comparative example will permit of a better understanding of the merits of the electric heater over the ordinary boiler. Let us consider a case where it is required to bring liquid to a boiling point situated at some distant point in the factory, away from the ordinary boiler. We may estimate the efficiency of the apparatus at 60 per cent., the boiler at 65 per cent., and finally the conducting pipes at 92 per cent. Under these conditions the final output of energy in heat units at the point of utilization will be

$$0.60 \times 0.65 \times 0.92 = 0.35,$$

or 1 kilogram of coal of average quality burned under a steam boiler will produce at the distant point

$$4,500 \text{ calories} \times 0.35 = 1,575 \text{ calories.}$$

Admitting that the coal costs 42 francs ($8.40) per ton, comprising the wages of the help, 1 kilogram will cost 4.2 centimes (.84 cent) and each calorie utilized will cost 0.26 centime (.052 cent).

With the electric boiler, figuring the price of electric energy at 1.5 centimes (0.3 cent) per kilowatt hour (which corresponds to the factory rates at Niagara) the price of a calorie is easy to calculate.

$$1 \text{ kilowatt hour} = 0.24 \times 3,600 = 864 \text{ calories.}$$

Admitting an efficiency of 98 per cent. for the electric boiler we can figure 850 calories as costing 1.5 centimes (0.3 cent), which makes the price of a calorie 0.17 centime (.03 cent).

With a steam boiler the price is 0.26 centime (.052 cent), giving a difference in favor of the electric boiler of 0.09 centime (.018 cent) which gives a saving of 33 per cent.

We may then consider Mr. Ougrimoff's apparatus to be a new application of electric heating capable of a great development, for it dispenses with fire boxes and chimneys, takes up less room, and is more easily shipped and installed and also lessens the fire risk.

It is easy to see that this little piece of apparatus is the starting point of a series of improvements which will finally permit of a more economical and rapid generation of steam in boilers of large sizes.

THE RITCHIE TELAUTOGRAPH.

The following description of the Ritchie Telautograph, the invention of Mr. Foster Ritchie, appears in the "Electrician," London. As will be seen, the principle is practically the same as that of Prof. Elisha Gray's instrument, which was exhibited quite extensively in this country some seven years ago, excepting that the modus operandi has been improved upon.

A very fair idea of the working of the instrument may be obtained from an examination of the illustrations here given. Fig. 2 shows the principle on which the instrument is based and Fig. 1 is a diagram of the connections. The pen is fixed at the extremities of two links, A and B, which are fixed to the arms of two otherwise independent rheostats, C and D. Each of these is connected through the battery to one of the two lines and has a total resistance of 7,000 ohms, divided into 496 steps. One of these rheostats is shown by the side of the instrument in Fig. 4. Thus currents, varying in magnitude with the position of the pencil, are sent along the two lines which connect the sending and receiving instrument. The receiving part of the instrument consists of two large d'Arsonval galvanometer movements, with strong controlling springs to ensure constancy. The spindles on which the moving coils are fixed are connected to a link motion corresponding to that of the transmitter part of the instrument, and move a pen along a similar piece of paper.

Having indicated the general principle on which the instrument is based, we now come to its constructive details. As is seen in Fig. 1, a battery is placed at each end of the line, these two batteries being normally in opposition. Before starting to write, the operator takes up the pencil, seen in the general view of the instrument, Fig. 4, and, with the point of it, pushes back a lever at the left of the lower

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or transmitter part. This works a mechanical grip, which clutches the paper and moves it forward about three-fourths inch, and at the same time operates a switch reversing the home battery, cuts off the receiving part of the home instrument, and connects up the transmitting portion. A further movement of this lever momentarily opens up the circuit of the home battery, the reason for which will be explained presently. The paper is 5 inches wide, and a length of about 2 inches is exposed at one time. During the motions of the pencil on the paper, currents varying in strength are sent along the lines F and G, returning in each case by the earth.

The lower part of Fig. 1 represents the transmitting part of the home station, and the upper part the receiving part of the distant station, but the complete instrument in each case is made up of a transmitter and a receiver. H and K are the coils of the d'Arsonval

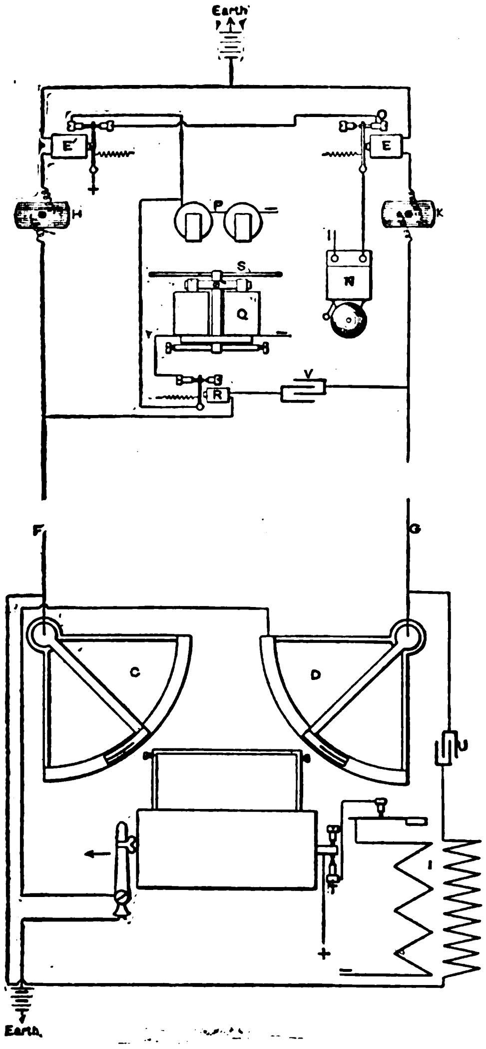

Fig. 1.—Diagram of Connections.

galvanometer movements, these movements being also seen distinctly in Fig. 4. The coils have about 600 turns of silk-covered wire impregnated with shellac varnish, and only the coil revolves, the cylindrical piece of iron at its center being fixed. The magnets are electromagnets excited by the local battery. An interesting feature of the instrument is that, instead of extreme delicacy being attempted in the construction of these movements, the reverse is the case. Twenty-four volt secondary batteries are employed at each end of the line, and the rheostat naturally forms the greater part of the resistance in the circuit, so that fairly strong currents, telegraphically speaking, flow through the coils. Added to this that the magnets of the d'Arsonval system are highly magnetized, it is seen that considerable mechanical forces come into play, so that the controlling spring attached to the moving

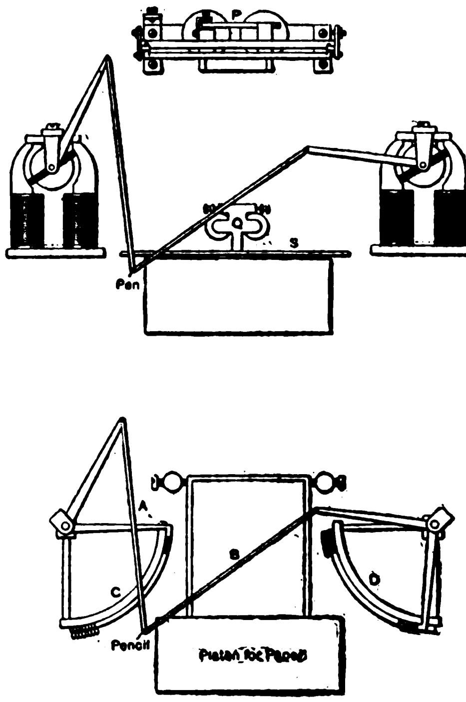

Fig. 2.

coil is strong, and, as a matter of fact, so strong that the spindle of the moving coil is merely held between centers, jewels being unnecessary. Thus the motion of the coil is decisive and dead-beat, and, moreover, adjustment is easy and the whole mechanism is substantial.

After traversing the moving coil on its way to the distant battery the current passes on either side through a relay E' and E. These relays are so adjusted that the weakest current (sent when the pencil is at the top left-hand corner of the paper) just suffices to cause their armatures to be attracted. When the current is momentarily interrupted by moving the paper-shifting and starting lever, the relay E' drops back. This causes the current normally flowing through the paper-shifting magnets P to be momentarily interrupted, and the release and re-attraction of the armature of P actuates the grip which moves on the paper. The

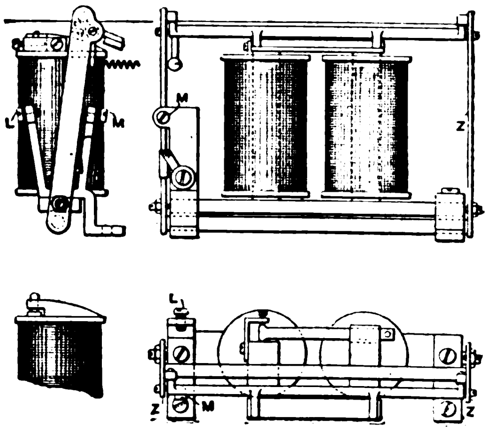

Fig. 3.—Details of Paper Shifter.

details of this paper-shifter are shown in Fig. 3, which is more or less self-explanatory. The whole frame Z rocks backward and forward when the current through the coils is interrupted and re-made. L and M are merely stops. The relay E is for the purpose of signaling. A press-key on one side of the transmitter (not shown in the diagram Fig. 1) on being depressed breaks line F and puts line G to earth. This causes the relay E' to release its armature and the relay E to make a contact at O, so that the local circuit of the bell N is closed and the bell rings. It should be mentioned that to avoid a multiplicity of lines

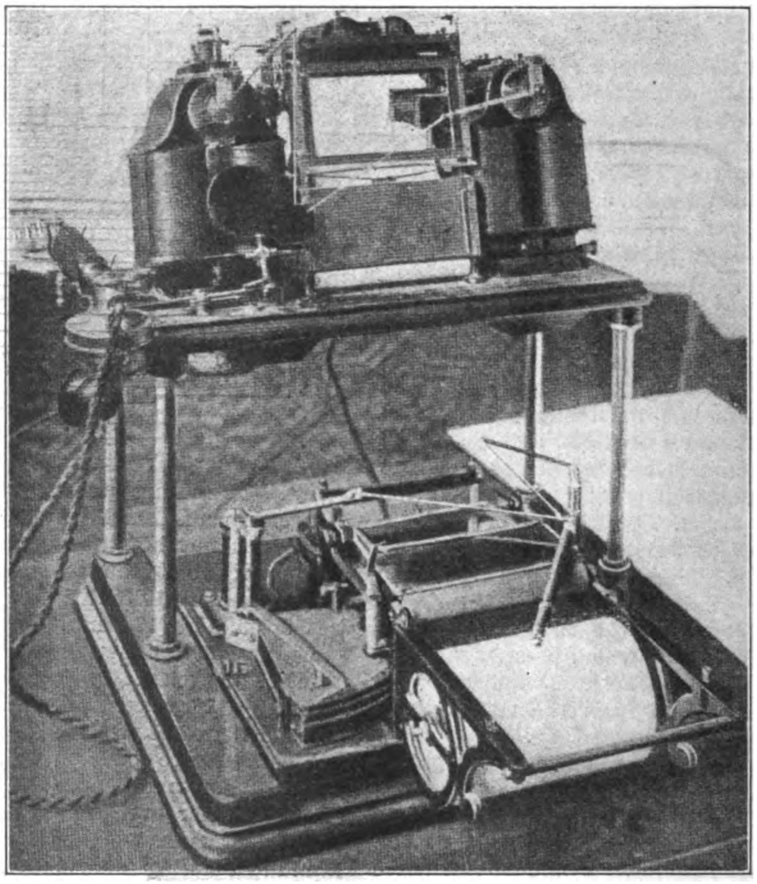

Fig. 4.—General View of Telautograph (cover and paper removed).

in Fig. 1 all the wires leading to the battery are not shown but some are broken off and + or — marked against them.

We now come to the ingenious device by means of which no characters are written on the paper at the distant station unless the pencil is actually pressing on the paper at the transmitting end. Motions of the pencil are transmitted to the pen, but the latter does not touch the paper until the pencil does. Normally the "pen-lifting" magnet Q is excited by the local circuit, the armature of the relay R being against the left-hand stop. This magnet Q raises the pen from the paper by slightly moving the cross-bar S in a horizontal direction away from the vertical paper. When, however, the pencil presses upon the platen on which the paper is stretched, it puts the battery in contact with the screw T, which closes the primary circuit of a small induction coil I whose hammer vibrates. Thus a vibratory secondary current is transmitted to line G through the condenser U, and passes to the receiving end, through the condenser V, and energizes the relay R. This breaks the local circuit of the magnet Q and allows the pen to fall back on the paper. The vibratory current returns by the line F, and not by earth, so that it does not affect neighboring telephone circuits. The circuit KEE'H has fairly high self-induction, and the relays E' and E are not influenced. It is also noticed that the local current reaches Q through the secondary contacts of the relay E' as well as of the relay R, so that when the apparatus is not in use and no current is flowing through E, no current is being wasted in the pen-lifting magnet. The same applies to the magnet P.

On finishing his message, and before laying down his pencil, the operator must press down, with the point of the pencil, a small plunger key on the left of the instrument to reverse the home battery so that it opposes the distant one, and to connect up the receiver to line instead of the transmitter. This switch is not shown in the diagram. The action of depressing this plunger also opens a local bell circuit, which is, moreover, opened at another contact so long as the operator's arm is resting on the desk. If, therefore, he retires from the instrument without switching off by depressing the plunger key, the bell circuit is closed and the bell rings until the omission has been remedied.

A telephone is employed in connection with the instrument. When the telephone is on its hook, the writing telegraph is connected to the lines in the manner already detailed, and on removing the telephone the writing telegraph is disconnected and the ordinary telephone connections substituted. The telephone is seen to the left in Fig. 4.

As already mentioned, a 24-volt secondary battery is employed at each end, and with this the instrument is found to work well on a line up to 300 ohms resistance. The resistance of each of the moving coils is about 185 ohms, and of the relays only about 20 ohms each.

An interesting detail is the pen employed. This resembles a tiny pipe-bowl, from which a thin glass tube conveys the ink to the paper. Each time the paper is moved on by pushing over the paper-shifting lever, and the circuit is thereby broken, the pen returns automatically to the inkpot on the "isobath" principle, as seen in Fig. 3.

A MODERN POLYPHASE CENTRAL STATION IN SWITZERLAND.

BY FRANK C. PERKINS.

The recent installation of polyphase apparatus at Zurich, Switzerland, is worthy of note. The great electrical manufacturing firm—The Maschinenfabrik Oerlikon, has its large establishment in the vicinity of that city and has installed a complete line of its apparatus in the Zurich Municipal Electric Supply Plant.

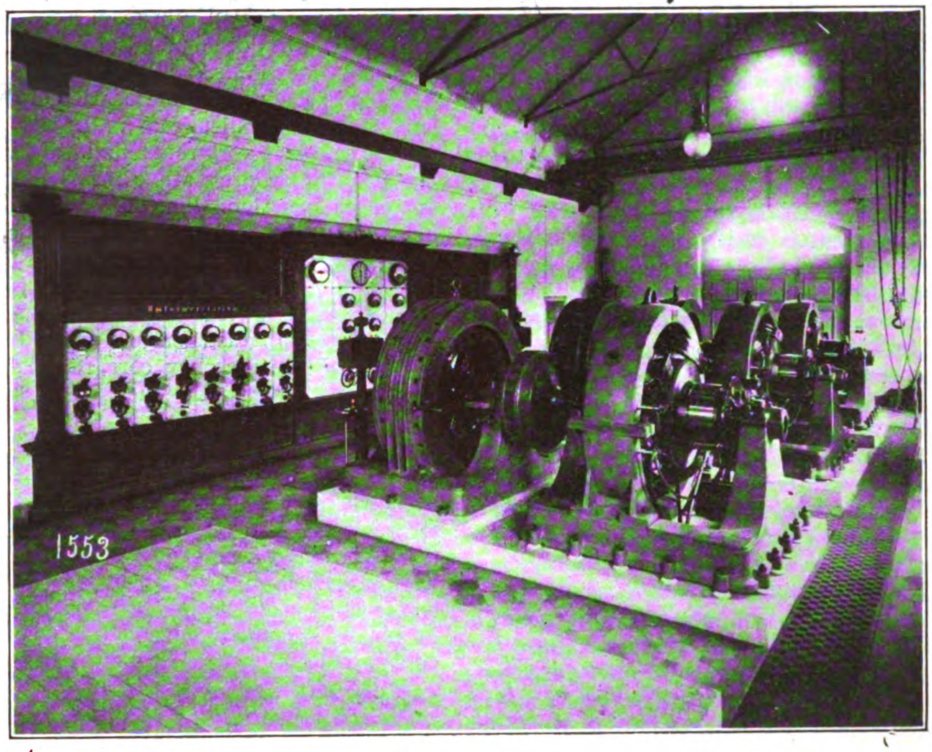

FIG. 2.—MOTOR GENERATOR SUB-STATION AT SELNAU, SWITZERLAND.

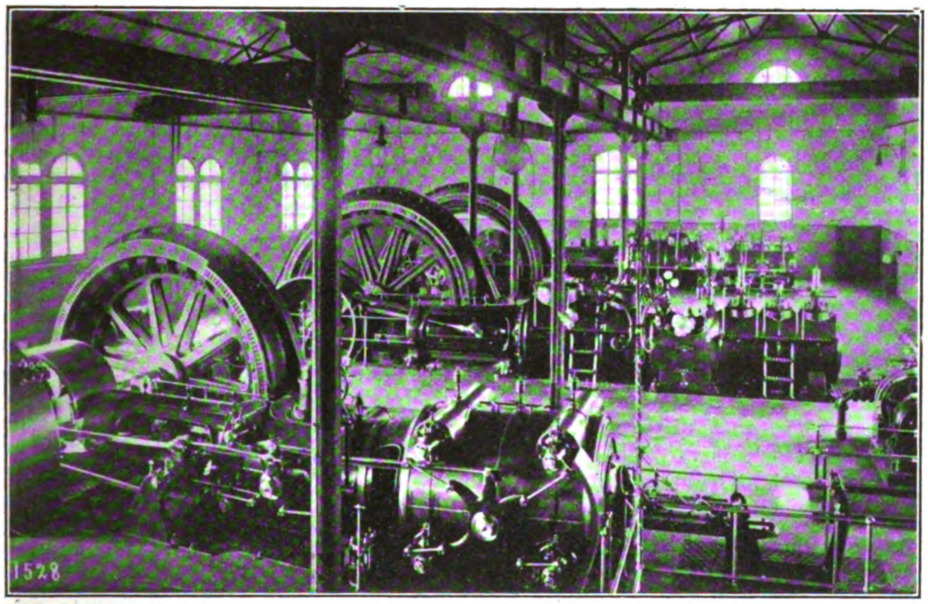

FIG. 1.—3,000 HP. POLYPHASE CENTRAL STATION AT ZURICH, SWITZERLAND.

The three direct connected units, seen in Fig. 1, consist of three polyphase generators, which are arranged so as to deliver either a Drehstrom or monophase current as desired. The unit in the immediate foreground has a capacity of 750 horse power and the two units in the background have each a capacity of 1,000 hp. The current is used for light, power and traction purposes, and is supplied from the generators at a potential of 2,000 volts.

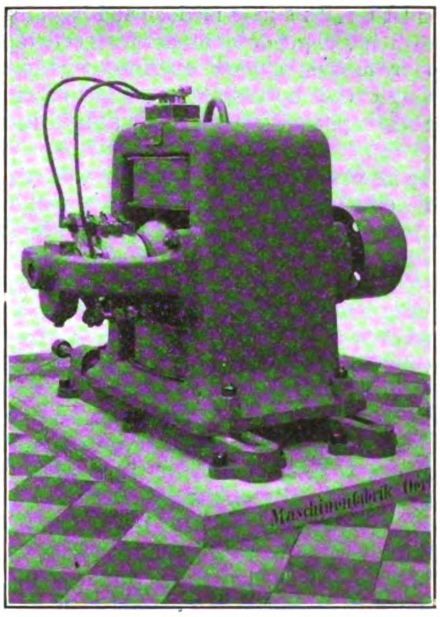

FIG. 3.—CONTINUOUS CURRENT MOTOR.

The illustration Fig. 2 shows the sub-sta-

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tion at Selnau where the current is transformed to a direct current for use on the power and traction lines. There are in operation in this sub-station three Oerlikon motor generators. These combinations have each a capacity of 300 horse power, and consist of three phase motors operating directly at 1,950 volts, and at a frequency of 50 periods per second. The speed of the motors is 370 revolutions per minute. To each motor is connected a direct current generator by means of flexible couplings. Each generator supplies a continuous current of 200 kilowatts at a potential of 550 volts. The switchboard shown in the background in Fig. 2 is arranged to control the alternating polyphase current from the line at one end and the circuit breakers, switches and direct current measuring instruments are placed at the other end. It will be noted that a wooden framework is used with marble panels on which the various instruments are mounted.

The alternating motors used directly from the central station are of the three phase type built by the Oerlikon Company, while the direct current motors are of the type shown in Fig. 3. This station has been operated with great success, and while not of the largest in size, is in every way a modern installation.

THE PLANT OF THE ST. CROIX POWER COMPANY OF WISCONSIN.*

BY HENRY FLOY.

The considerable number of high tension long distance transmission plants already in successful operation might not render the completion and starting of a 25,000 volt plant of any particular interest, except that in all engineering work, and especially in electrical lines, the "newest" usually means something of a change from, and improvement upon anything previously constructed.

About two years ago the St. Paul Gas Light Company of St. Paul, Minn., owing to increasing business, the depreciation and antiquity of its generating apparatus and the expense of operating four distinct stations, foresaw that it must build a single modern and larger steam generating plant or arrange for securing current by means of long distance transmission through the development of one or more of the water powers within reasonable distance of St. Paul.

Upon investigation it was found that 27 miles east of St. Paul, on Apple River, in the State of Wisconsin, there was a natural fall of about 30 feet. Above the fall a dam could be built to a height of 47 feet thus affording with a slight drop in the river below the fall a total head of 82 feet. Apple River is fed from innumerable springs and some 25 lakes in North-Western Wisconsin and in consequence its discharge is remarkably uniform the year around. With the head afforded the minimum flow of water in the stream would yield about 2,000 hp. continuously and during most of the year nearly twice that amount. By the building of a dam, a large reservoir would be formed from which the impounded water could be drawn in any quantity necessary to carry the peak of any load in St. Paul, provided sufficient capacity was installed in water-wheels, generators and transmission line. It was thus demonstrated to the St. Paul Gas Light Company that the power that could be made available at Apple River Falls by a development of the character just outlined, would permit not only the complete shutting down of its four steam plants and avoid the necessity for building a modern steam plant but also provide it with nearly twice the salable output of its old stations.

Accordingly, about a year and a half ago, there was organized under the laws of the State of Wisconsin the St. Croix Power Company. This company is friendly to the St. Paul Gas Light Company and to the latter the former contracted to sell all the current it could generate by the development of a power plant at Apple River Falls.

Owing to the inaccessible location of the dam, being about five miles from a railroad station, and the country very rough and hilly, the importation of building stone for the dam was out of the question. The only material available at the falls is a brown sandstone, somewhat harder than the St. Peter rock underlying much of St. Paul and Minneapolis, but not hard enough to withstand constant attrition of the water. It was therefore decided to build the dam with a masonry core, resting on concrete foundations and enclosed in concrete facings.

The dam is of the arched type, being built as the arc of a circle having a radius of 450 feet. Near the north bank, close to the bed of the river, two steel pipes, each five feet in diameter are built into the concrete work and fitted with gates and crabs to permit control of the water while constructing the dam, or in time of repair, and the regulation of flow over the spillway in case of unusually high water.

At the south end of the dam are the trash racks and near them a sluice for conveniently disposing of the debris and ice.

The length of the spillway is 108 feet, and the total length of the dam 350 feet. There are 3,138 cubic yards of concrete and 5,025 cubic yards of rubble masonry in the dam.

It is a pleasure to state that although this dam has experienced extremes of temperature and stresses, it does not show any signs of cracks or leakage; and a number of engineers, experts on this class of work, who have seen the dam since its completion, unanimously agreed that the concrete work is of the highest grade and that the dam as a whole is a most perfect monolith.

In the dam at the head of the flume are three head gates and the iron trash rack, while at the lower end of the flume in the fore-bay are three tail gates with finer trash rack.

The penstock is 12 feet in diameter. It takes its beginning in the fore-bay and extends in a horizontal direction 88 feet to the brow of the hill, down which it continues 107 feet at an angle of about 45°. Then it turns again and continues in a horizontal direction 118 feet further. The penstock is of open hearth steel plate, ⅜ inch thick above the elevation 140.61 and seven-sixteenth inch below that elevation. The sheets of which the penstock is composed are held together by rivets, spaced two and one-half inches on centers, all rivet holes being punched one-sixteenth inch small and reamed out to full size; all joints being caulked and the whole painted with an iron preservative paint. The penstock is supported throughout its length on suitable masonry piers. On the hill-side, the earth has also been tamped under the pipe to give it additional support. The lower end of the penstock is provided with four branch pipes supplying four main sets of waterwheels, and a smaller fifth branch pipe ending in a "Y" supplies two separate exciter wheels. At the lower end the penstock is provided a gravity automatic relief valve having a discharge 12 inches in diameter. The last section of the penstock is provided with a blank opening for an additional and fifth unit in case it ever becomes desirable to install the same.

GENERATING STATION.

The generating station is a fire-proof structure of brick and iron, about 140 x 50 feet, divided longitudinally by a partition wall, thus separating the wheel-room from the dynamo-room.

In the wheel-room are four main sets of water-wheels, space being reserved for the fifth unit which may be added latter. Each set consists of two 36 inch special "Victor" wheels, mounted horizontally in a nine feet cylindrical steel wheel-chest from which they discharge through a six feet draft tube, eight feet long. Each pair of wheels is, of course, on a single shaft which extends through the end of the wheel-chest built into the partition wall, and is direct connected to a 750 kw. generator

Each wheel-chest is supplied from the penstock by its own feeder pipe in which is located a 56 inch gate valve operated from a shaft driven by a 7½ hp. electric motor. Each wheel-chest is surmounted by an automatic spring relief valve having an opening 12 inches in diameter. There are two exciter wheels, each direct connected to a 30 kw. direct current generator. The exciter wheels have their own branch feeder pipes, wheel-chests and separate gate-valves.

The waterwheel governors are of an improved type of the Geissler pattern. They are guaranteed to maintain the speed within 3 per cent. of normal for any instantaneous change in load not exceeding 25 per cent. of the load at the moment of variation. The governors are electrically controlled, being operated by the 125-volt excited current.

All the alternators are 750 kw., 3-phase, 800 volt, 60 cycle revolving armature, separately excited machines, running at 300 r.p.m. They will carry full load continuously without heating more than 40° C. above the temperature of the surrounding air, and have an inherent regulation slightly under 5 per cent. on non-inductive load.

The direct-current exciters are shunt wound, operating at 925 r.p.m., and each machine is of sufficient capacity to excite five 750 kw. alternators.

Across the lower end of the dynamo-room is the marble switchboard consisting of an exciter panel, four generator panels, two transformer panels, and a local service panel. The exciter panel is supplied with the usual instruments but the alternator panels are each equipped with one main oil switch, in series with two triple-pole, quick-break jaw switches, for throwing the machine on to either two sets of bus-bars. At the top of the panel is an ammeter, an indicating wattmeter, and a field ammeter with the usual synchronizing lamp, field-switch and voltmeter plug. The transformer panels will each be provided with an induction recording wattmeter, a single three-phase oil switch of special design, having a capacity of 1,500 kw. at 800 volts, and a potential indicator which enables operators at the generating station switchboard to determine the voltage at the St. Paul sub-station,

*Abstract of paper read at the 148th meeting of the American Institute of Electrical Engineers, New York, November 23, 1900.

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regardless of the power factor of the load or the drop in the line.

The local service switchboard panel is equipped with switches for controlling the electric heaters by which the power-house is warmed, also the incandescent and arc lighting circuits and the motors driving the blowers.

There have been installed six air-blast transformers of 500 kw. capacity each, which step the voltage up directly from 800 to 25,000 volts. As operated, the transformers are connected in two sets of three each with "Y" connections. The low tension side of each set of transformers is joined directly with the transformer panel switches, and the high tension side with "spider" switches, through the use of which either bank of transformers may be connected to either or both of the transformer circuits.

TWENTY-FIVE THOUSAND VOLT OVERHEAD AND UNDERGROUND TRANSMISSION LINE.

Two three-wire, three-phase transmission circuits, each consisting of 24½ miles of overhead bare copper wires and three miles of underground cables connect the generating plant with the distributing station in St. Paul.

Both overhead circuits are carried on a single line of poles. The wires of each circuit are on one side of the poles and are supported so as to be at the verticles of an equilateral triangle, having 24 inch sides. The conductors are of No. 2 B. and S. medium hard-drawn copper wire, carried on glass insulators of the "Provo type"—the same as those used on the 40,000 volt transmission in Utah. The insulators are 7 inches in diameter and have a triple petticoat. They are mounted on special locust pins boiled in paraffin, carried on two 4 x 5 inch Oregon fir cross-arms. The poles are mainly of Oregon fir and are spaced not more than 110 feet apart. No poles less than 30 feet in length and eight inches in diameter at the top are used. Poles of minimum length are planted 5½ feet in the ground and six inches deeper for every additional five feet in their length. The line was designed to be practically level, irrespective of configurations in the earth's surface. The corners and angles in the line are reduced to as few as possible, consistent with securing a right of way at a reasonable price; no angle in a conductor at any insulator is less than 165°, thus avoiding any dangerous tendency to break the pins. In making a right angle turn special construction is used affording seven points of support for each wire. For slight turns two or three poles, as may be required, are set ten feet apart but no more than one insulator per wire is allowed on a single pole.

The transmission line really takes its beginning at the terminals of the step-up transformers in the dynamo-room of the generating station, whence it passes through the high-tension switches into a brick lightning arrester house abutting against the end of the power house. Here are located choke coils and lightning arresters. From the arrester house the wires pass out through circular openings in the wall, which are sheltered by a gabled roof, and run thence in a general western direction to a similar arrester house in the city of St. Paul, where they terminate in the heads of the underground cables.

There are two three-conductor lead-covered cables connecting the lightning arrester house with the distributing sub-station, located on Cedar street in the very center of the business section of St. Paul. These cables are in four-hole McRoy vitrified clay conduits laid in concrete. The conduits follow the grade of the streets except where it was necessary to pass under a number of railroad tracks in a deep cut. Here, the conduits end in the top of a brick well about fifty feet in depth, down which the cables drop, passing from the bottom of the well in other conduits to another well on the opposite side of the tracks, through which they rise again to the conduits laid below the pavements of the street.

In considering the use of cables for 25,000 volt transmission underground, the writer found that a number of reputable manufacturers not only declined to bid on his specifications, but would not entertain any proposition for furnishing such cables, even under their own specifications. There were only two companies that would undertake the work and accordingly a contract was entered into with these companies, one to furnish a rubber insulated and the other a paper insulated cable.

The specifications provided that the general design of both cables should be the same, that is, each conductor having an area not less than 66,000 cm., is composed of seven strands of copper wire, enclosed in insulation, the three laid up in jute and the whole enclosed in a jacket of the same insulating material as that used about each conductor. Outside of the jacket is the lead sheathing ⅛ inch in thickness, making the cable complete about 2¼ inches in diameter.

The "National" cable is insulated with paper treated with a secret compound. The insulation about each conductor is nine-thirty-seconds inch in thickness. That of the enveloping jacket, four-thirty-seconds inch thick. The covering of this cable is of lead protected on the exterior by a coating of tin.

The calculated resistance of each conductor between the generating and distributing stations is 23 ohms. The drop in voltage between the same points, for 3,000 kw., delivered with a 90 per cent. power factor, and 25,000 volts initial potential figures 7.7 per cent. operating both lines in multiple, which will be the usual practice.

SUB-STATION AND APPARATUS.

The distributing station in St. Paul is an iron and brick building designed to contain the necessary apparatus for reducing the potential and controlling and transforming the energy received over the transmission line, for distribution in the city of St. Paul. The building is 50 x 70 feet; two and a half stories in height. One-half of the building has a basement divided into two rooms, one, in which all the static step-down transformers and high tension switches are located, is connected by a tunnel with the street conduits; the other serves as a toilet room and place in which to locate the apparatus for heating the station.

Each conductor of two high-tension cables passing through the tunnel into the transformer room, ends in one terminal of a single-pole knife switch, to be operated only when current is off the line and installed to permit convenient testing of cables, etc. The other terminal of each switch is connected to a high-tension bus-bar, from which taps are taken off to the high-tension switches controlling the circuits to the different sets of transformers. The ends of the cables are also connected to static discharges, which are merely a number of standard lightning arresters, connected in series.

The high-tension bus-bars and their taps to the high-tension switches and from the switches to the transformers, are single conductors insulated with one-fourth inch of best Para compound, and guaranteed to withstand 25,000 volts continuously. The conductors are carried in conduits made of wood pulp indurated with asphaltum, manufactured by the Fibre Conduit Company. The conduits are guaranteed to withstand 20,000 volts without breaking down.

The high-tension oil switches are of the single-pole three-break type, operating under oil and designed to break 25,000 volts and 50 amperes. The switches are closed by hand but opened by the releasing of a latch controlled by a local circuit from the main switchboard up-stairs. There are 24 high-tension switches in all—12 connected with each set of the cable bus-bars. As all high-tension work is three-phase, this necessitates the closing of three switches to connect any set of transformers with either set of bus-bars.

There are four banks of static step-down transformers—two banks consisting of three 22,500 to 78-volt oil-cooled 300 kw. three-phase to six-phase transformers and two banks of two 22,500 to 2,100-2,700-volt oil-cooled 200 kw. three-phase to two-phase transformers.

Each one of the 300 kw. transformers has a single winding on the primary, and two entirely distinct and separate windings on the secondary. By connecting three of these transformers in a set, the three-phase to six-phase transformation is effected. One set of these transformers supplies current to the rotary converters, operating between the positive and neutral wires, and the other set to those rotaries operating between the neutral and negative wires of the Edison three-wire system of distribution throughout the city. There is kept on hand a spare transformer in case of break-down, but as all transformers in the sub-station are connected in delta, it is perfectly feasible to successfully operate although there are but two transformers of a set connected in circuit. In fact, this was the method of operating for the first few weeks after starting the plant and until the remainder of the transformers were received.

The two identical sets of three-phase to two-phase 200 kw. transformers provide for the alternating current distribution throughout the city. On the front of each transformer case is mounted a quick-break multipoint switch connected with leads brought out from the secondary windings of the transformers. The movement of the switch throws more or less turns of the secondary in circuit and thus adjusts the potential in steps of 21 volts to any desired point between 2,100 and 2,700 volts.

The use of six-phase transformers and converters is novel. The reason for the adoption of six-phases instead of three-phases was to secure the advantages of reduction of copper losses in the armature, and the accompanying reduction of temperature and its better distribution. At first sight it might seem that the increased complexity involved in the use of six-phases would not counterbalance the advantages to be gained. Practically, however, the use of six rings and the necessary additional taps to the windings on the armatures amount to nothing in the operation of the machines. The dividing of the secondary windings on the transformers for two independent circuits results in no complication or expense. On account of the large current, the use of six conductors between the transformers and switchboard and between the switchboard and rotaries was necessary whether three-phase or

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six-phase machines were installed. The switchboard is practically the same for either number of phases except that the number of main switches was increased from two to three. This disadvantage, however, may be disregarded when a decided increase in the capacity of the rotaries is secured. The rotaries are ordinarily started from the direct-current end, but are equipped with break-down field-switches and designed for starting from the alternating-current end when necessary.

A Medal for the Farr Telephone Exhibit.

Mr. Drake, the Director of Machinery and Electricity at the Paris Exposition, has informed the Farr Telephone & Construction Supply Company, 357 Dearborn street, Chicago, that it has been awarded a bronze medal by the International Jury of Award for the Paris Exposition.

American Motors for European Canals

F. W. Hawley, who has been commissioned by large American interests to advocate and explain the principle of electric propulsion for canals, has returned to London from the Continent after a successful journey. He reports that plans for electric canal service have been adopted in Belgium and Holland, and that the waterways of those countries will be equipped with motors similar to those proposed for operation on the Erie Canal. These motors will be provided by an American company, and the entire system of electric propulsion of canal boats will be introduced from the United States. Mr. Hawley has been working with excellent results in France, and asserts that a bill has been prepared for submission to the Legislative Chambers for the introduction of the same system of canals in that country. He also expects that electric motors for French canals will be ordered from the United States.

The National Telephone Company.

The National Telephone Company, 33 and 35 Lafayette avenue, Detroit, Mich., is manufacturing a line of high-grade telephone instruments for which there is much demand. This concern—which is an independent one—handles the central energy pole system, the central energy tower system and the central energy underground system. The company has branch offices at Vandalia, Ill., Chicago, St. Louis and Milwaukee, as well as in Paris, Berlin and London. The president of the company is Mr. Phil Geluk, while the secretary and manager is Mr. W. J. Kurtz, M. E.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended November 30:

Amsterdam, 1 case, $200; Antwerp, 25 packages, $1,728; 1 case $127; Argentine Republic, 49 cases, $3,605; Brazil, 82 cases, $4,244; Bremen, 14 packages, $842; British West Indies, 11 cases, $140; British Possessions in Africa, 25 cases, $884; Central America, 40 packages, $773; Christiania, 2 cases, $25; Chili, 25 cases, $505; Cuba, 84 packages, $12,354; Dresden, 2 cases, $75; Dutch West Indies, 17 packages, $502; Ecuador, 10 packages, $186; Genoa, 214 packages, $47,872; Glasgow, 11 cases, $2,365; Hamburg, 7 cases, $3,255; 20 packages, $1,850; Havre, 38 packages, $3,107; Hayti, 2 cases, $45; Hong Kong, 189 cases, $6,633; Japan, 71 cases, $22,707; Leeds, 2 cases, $60; Liverpool, 138 packages, $17,989; 2 packages motor trucks, $175; 62 electric cables, $25,075; London, 188 packages, $14,972; Manchester, 6 packages, $690; Marseilles, 20 cases $1,860; Mexico, 112 packages, $11,351; 5 cases $187; Milan, 41 cases, $5,127; Naples, 40 packages, $560; Newcastle, 51 cases, $7,830; New Zealand, 1 case, $71; Oporto, 1 package, $70; Peru, 2 cases, $33; 50 packages, $1,390; Porto Rico, 57 packages, $1,604; Revel, 48 cases, $516; Riga, 17 packages, $3,403; Southampton, 80 cases, $5,147; 27 packages, $1,517; St. Petersburg, 2 cases, $2,206; U. S. Colombia, 50 packages, $1,230; Vienna, 11 cases, $1,608.

PERSONAL MENTION.

Mr. H. Durant Cheever is in London for a long visit, looking after the large foreign business of the Okonite Company of New York.

Mr. Horatio A. Foster has established headquarters as a consulting electrical engineer at 310 Chestnut street, Philadelphia, Pa.

Mr. Herman Wilkiemeyer, vice-president and general manager of the Evansville (Ind.) Gas & Electric Company, died recently of Bright's disease at Cincinnati. His friends claim he was the inventor of the Welsbach light.

INCORPORATIONS.

The Enberg Electric & Mechanical Works, St. Joseph, Mich. Capital stock, $5,000.

The Mayfield Electric Light, Heat & Power Company, Mayfield, Pa. Capital stock, $5,000.

The Story City Electric Light & Power Company, Story City, Ia. Capital stock, $10,000. J. Molstre president.

The Bliss Electric Car Lighting Company, Newark, N. J. Capital stock, $250,000. Incorporators: William L. Bliss, John L. Bliss and Henry Sanger Snow.

The Consolidated Safety Third Rail Electric Company, New York City. Capital stock, $100,000. This company expects to secure control of all third rail plants.

The Electric Equipment Company, New York City. Capital stock, $5,000. Directors: C. J. Klein and C. L. Sefort, New York City, and H. E. Wadsworth, Brooklyn.

The Des Moines Edison Light Company, Des Moines, Ia.—to do an electric light business. Capital stock, $1,125,000. Incorporators: H. C. Levis and H. M. Francis, both of New York.

The New Jersey Light, Heat & Power Company, Camden, N. J.—to furnish electric light, heat & power. Capital stock, $200,000. Incorporators: H. O. Burt, H. J. Smith, J. B. Miller, H. C. Stewart and W. B. Freland.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED NOVEMBER 27, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

662,386. Electric Traction for Tramway or Similar Vehicles. Arthur Baisieux, Brussels, Belgium. Filed July 31, 1900.

662,419-662,420. Electric Railway. William Grunow, Jr., Bridgeport, Conn., assignor to the McElroy-Grunow Electric Railway System, same place. Filed April 5, 1900.

662,423. Current-Collector. William Grunow, Jr., Bridgeport, Conn., assignor to the McElroy-Grunow Electric Railway System, same place. Original application filed April 5, 1900. Divided and this application filed May 21, 1900.

662,456. Safety Device for Street-Railway Cars. Thomas Mulholland, Pittsburg, Pa. Filed Aug. 28, 1899.

662,497-662,498. Railway-Crossing Signal. Nicholas Ratchford, Greenville, O. Filed June 20, 1899, June 26, 1899.

662,595. Trolley-Wire Suspension. John W. Haynes, Manchester, Conn. Filed March 10, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

662,510. Incandescent-Lamp Socket. Ernest P. Warner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed May 20, 1899.

662,580. Apparatus for Electrically Lighting Railway-Carriages, etc. Charles Vicarino, Nancy, France. Filed April 24, 1900.

662,727. Attachment for Arc-Lamps. Edwin B. Jones, Chatham, Can. Filed May 26, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

662,450. Controller for Electric Motors. John B. Linn and Maxwell W. Day, Schenectady, N. Y., assignors to the General Electric Company of New York. Filed Sept. 17, 1898.

662,465. Commutator. Edward D. Priest and George L. Schemerhorn, Schenectady, N. Y., assignors to the General Electric Company of New York. Filed June 30, 1900.

662,480. Automatic Circuit-Controller. George H. Whittingham, Baltimore, Md. Filed March 19, 1900.

662,570. Ceiling-Switch. Ernest A. Lowe, North Plainfield, N. J., assignor of one-half to Charles W. Leveridge, Plainfield, N. J. Filed June 4, 1900.

662,630. Brush-Holder for Electric Machines. Sidney H. Short, Cleveland, O., assignor, by mesne assignments, to the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa. Filed July 28, 1898.

662,758. Commutator-Brush Holder. Harry Bishop, New York City. Filed July 3, 1900.

662,772. Electric Motor. Joseph Darling, Chicora, Pa. Filed Sept. 1, 1900.

662,784. Apparatus for Interrupting Relatively High Potential Circuits. William Grunow, Jr., Bridgeport, Conn., assignor to the McElroy-Grunow Electric Railway System, same place. Filed Nov. 20, 1899.

662,785. Apparatus for Rupturing High-Potential Electrical Circuits Without Dangerous Arcing. William Grunow, Jr., Bridgeport, Conn., assignor to the McElroy-Grunow Electric Railway System, same place. Filed June 13, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

662,543. Telephone-Switch. Levi M. Neher, North Manchester, Ind. Filed April 4, 1900.

MISCELLANEOUS.

662,409. Apparatus for Separating Gold from Magnetic Sands. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Filed March 19, 1900.

662,410. Magnetic Separation. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Original application filed March 19, 1900. Divided and this application filed April 14, 1900.

662,411-662,412-662,413-662,414. Magnetic Separator. Elmer Gates, Chevy Chase, Md., assignor to Theodore J. Mayer, Washington, D. C. Filed April 14, 1900, July 12, 1900.

662,422. Electrical Resistance. William Grunow, Jr., Bridgeport, Conn., assignor to the McElroy-Grunow Electric Railway System, same place. Filed April 5, 1900.

664,444. Insulating Composition. Carl Jung, Vienna, Austria-Hungary, assignor of two-thirds to Adolf Kittel and Adolf Brecher, same place. Filed Dec. 19, 1899.

662,463. Casing for Electrical-Conductor Joints. George H. Paul, New York City. Filed June 2, 1900.

662,466. Lightning-Arrester for Safety Cut-Outs for Electric Circuits. Joseph Sachs, Hartford, Conn. Filed Sept. 28, 1899.

652,484. Electric Top for Gyroscopes. Emil Ziehl, Berlin, Germany. Filed Dec. 26, 1899.

662,491. Portable Electrical Device. John S. Mead, Buffalo, N. Y., assignor of one-half to William Comerford, same place. Filed Jan. 30, 1900. Renewed Oct. 24, 1900.

662,501. Safety Cut-Out for Electric Circuits. Joseph Sachs, Hartford, Conn. Filed Sept. 28, 1899.

662,527. Telegraph Signaling Apparatus. Edward B. Ellicott, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 8, 1899.

662,537. Electric Smelting Furnace. Hugo Koller, Nuremberg, Germany. Filed May 17, 1900.

662,549. Semaphore-Operating Mechanism. Judson Shoecraft, Eskridge, Kans., assignor to Charles C. Gardiner, Bradford, Kans. Filed June 23, 1900.

662,587. Insulated Support for Electric Conductors. Charles C. Blake, Portsmouth, N. H. Filed May 18, 1900.

662,622. Electric Battery. Arthur W. Harrison, Los Angeles, Cal., assignor of one-half to William A. Fruhling, same place. Filed June 16, 1900.

662,657. Electric Burglar-Alarm. Henry Rohrdantz, Buffalo, N. Y. Filed April 14, 1900.

662,679. Reversible Primary Battery. Leon W. Pullen, Camden, N. J., assignor to the Pullen Battery & Electrical Manufacturing Company of New Jersey. Filed Sept. 16, 1899.

662,707. Electrical Connector. Henry Blackman, New York City. Filed June 6, 1899.

662,719. Electric Fire-Alarm. Charles L. Haight, Poughkeepsie, N. Y. Filed Jan. 25, 1900.

662,752. Transmission of Electrical Impulses. Frederick Bedell, Ithaca, N. Y. Filed July 6, 1899.

662,803. Burglar-Alarm. Junius L. Murphy, Denver, Col. Filed Feb. 4, 1899.

662,833. Railway Signaling. Samuel D. Strohm, Philadelphia, Pa., assignor to the Strohm Automatic Electric Safety Block Signal Company, same place. Filed Aug. 29, 1891. Renewed June 5, 1900.

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THE TELEPHONE WORLD.

The Independent Company Making Great Progress.

The New York "Commercial" says that the removal of the main offices of the Erie Telephone Company to New York calls attention to the work which is now being carried on by the officials and management of the Telephone, Telegraph & Cable Company of America.

For the past few months they have been engaged in the work of centralizing the executive departments of the numerous companies absorbed and in harmonizing and connecting the companies which have hitherto been operated independently.

For nearly a year after the big national opponent of the American Bell Company was organized the work of the promoters of the company was confined mainly to acquiring independent companies. While the company has not as yet given up the purchasing of small companies, which will provide links in the general national system, its best efforts were directed to organizing the companies it has acquired.

W. H. Beers, a director of the Telephone, Telegraph & Cable Company of America, who was formerly located in this city, is now in the West. He has taken up headquarters at Fort Wayne, Ind., which is the district where the work of organization is now being centralized. In Indiana, Ohio and other Western States the independent telephone movement has had its greatest success, and it is in this district where the greatest work is now being done.

A large number of companies in actual operation have been absorbed by the National Company in Ohio, Indiana, as well as Michigan. These companies are now being made links in the great national telephone system which is being built up in opposition to the Bell.

So far the new International Telephone, Telegraph & Cable Company, which was formed this summer, has not taken over the Telephone, Telegraph & Cable Company of America, as it was believed it would after it was formed. The same interests which control the newly formed company also control the old company, so that the work begun by the latter will go on under any circumstances.

There is great interest in the coming decision by Judge Brown in the cases of the Bell Telephone Company against the National and Century Telephone. There have been times in the past, says a Boston, Mass., paper, when a decision in a telephone case has seriously affected the stock market, in one instance the fluctuations varying over 100 points, but there is no probability that there will be any such result in the present instance, although the decision is a most important one inasmuch as it will determine the validity of the Berliner patent. No one but Judge Brown knows the nature of the decision, or when it will be given. There are intimations that whatever the decision may be, the case will be carried to the Court of Appeals, and from there to the United States Supreme Court. Another telephone case, that of the Western Union against the Bell, a suit growing out of contracts between the two corporations, was argued before Judge Colt some time ago and now awaits decision.

The directors of the Dubuque Telephone Company held a meeting a short time ago and heard the reports of the officers. These showed the company to be in a most prosperous condition under the management of President Stevens, also that the company has a bright future before it. It was decided to declare a dividend of 20 per cent.—something that the company has been doing since it was organized. About fifteen new telephones per day are being put in through the underground conduits. The list now includes several hundred subscribers in Dubuque, Ia.

One of the most important moves that has been made in independent telephone circles is the deal between the United States Telephone Company and the Pittsburg & Allegheny Telephone Company. By the terms of the contract the United States Company gains control of long distance lines, which will make complete the connection between Cleveland and Pittsburg and ultimately reach to Baltimore.

The corporation owning several independent telephone exchanges in Texas has a representative in Austin who will shortly apply to the city council for a franchise to put in a system. A franchise was refused some months ago by a vote of 4 to 3, but there has been a change in the council.

The Island Telephone Company was recently chartered to connect Charleston, James Island, Wadmalaw, Edisto Island and John's Island, S. C. The capital stock is $4,000, and the officers: Reginald F. Fennell, president; Cecil G. Fennell, vice-president, and Malcom O. Duncan, secretary.

Bath, Me., is to have 100 new telephones this month.

Northern Pacific Railroad to Use Telephones.

According to a recent report from St. Paul, Minn., the Northern Pacific Railway has decided to substitute the telephone for the present telegraph system of the road and will build and equip long-distance and divisional telephone lines to take the place of the telegraph, wherever it shall be deemed practicable. The officials of the road believe that most of the telegraphing that is now done in connection with the traffic department can be as well or better performed by telephone.

The plan is to place each station in a division in direct communication with the division headquarters, and the various division headquarters are to be connected with the general offices by long distance lines.

In this way much information of importance to the traffic and operating departments which, on account of the limitations of the telegraph system, must now be sent by mail, can in the future be telephoned. Telephones are now used quite extensively and with marked success on some Eastern roads. The Northern Pacific, however, will be the first of the Western lines to adopt this system.

A meeting of the Southern Illinois Telephone Association, which embraces all the independent companies of Southern Illinois, was held recently in Benton, Ill., in connection with a representative of the Kinloch Company of St. Louis, with a view of arranging long distance connection from Southern Illinois points to St. Louis and other distant points. A proposition was submitted to the Kinloch people by the association, and if it is accepted, which it likely will be, connection will be made.

There is a movement on foot to have a telephone line built from Vernon to Knoxboro, N. Y., and also from Vernon to Kenwood, N. Y. Whatever is done in regard to these two lines will have to be done by local enterprise. The expense will not be very heavy. The lines will be run into the office of the Rome Home Telephone Company, so that parties having 'phones in their home can also talk with Oneida, Verona, Lowell, Rome and many other places into which the lines of the company run. It is probable a meeting will be held soon to consider the matter.

A news telephone service has been established at Budapest, the object of the scheme being to supply subscribers with reports of all the important occurrences which are ordinarily chronicled in the daily papers. The service has a main line 168 miles in length, and it is connected with private houses and various public resorts. Between 7:30 A.M. and 9:30 P.M. 28 editions of news are spoken into the transmitter by ten leather-lunged individuals who work in shifts of two.

The Rochester Telephone Company, at Honeoye Falls, N. Y., which has been delayed for several weeks, has succeeded in making its connection with the Mendon Center Telephone Company's line. The exchange and toll station are now opened for the public's use.

A farmers' telephone line is being constructed from Rushford to Choice, via Bratsberg, Minn. Connections will be made with the Phoenix exchange, thus giving the farmers all the advantages enjoyed by the toll lines.

The Citizens' Telephone Company has completed a metallic service line from Jackson to Horton and Hanover, Mich., and next spring the line will be continued to Moscow, Hillsdale and other neighboring towns in that State.

The Pacific States Telephone Company has an inspector looking over the route between North Yakima and Prosser, Wash., with a view towards establishing a long distance service at the latter place.

At Mangum, Okla., Mr. Brittain from Texas is looking over the situation with a view of putting in a telephone exchange, and also running a line to Granite, Combs and Cordell, Okla.

The Long Distance Telephone Company of Virginia is now constructing a telephone line from Forest to Lychburg, Va. This will, when completed, give two lines for communicating by 'phone from Forest to Virginia cities.

The Citizens' Telephone & Construction Company of Nashville, Tenn., has been chartered, with a capital stock of $10,000.

The Cincinnati, O., Telephone Association has made the offer to the board of education to place a telephone in every public school building free of charge.

Municipal 'Phone Service for Toronto.

The city of Toronto, Ont., lately started on the first stage of its municipal telephone project. It has issued contracts which citizens are to sign and return to the city clerk, and as soon as 3,000 citizens have offered to become subscribers then a by-law will be submitted to raise the necessary money and the system will be put into operation.

There is a movement on foot to effect a combination of the Virginia Long Distance Telephone Company with the Interstate Telephone Company of North Carolina. The Virginia Company is gradually connecting the various local lines so that when it is completed the combination referred to may be effected. This matter is not new, but at a meeting some time ago of the Virginia Company the subject was discussed, and it is not unlikely that the result will be satisfactory to both companies when the local companies become united.

From Tahlequah, I. T., comes the report that the Cherokee Legislature has passed a few bills granting franchises to build telephone lines in the Cherokee Nation, one line to be put in from Owasso to Caney, Kan., one line from Stillwell, I. T., by Tahlequah to Wagoner, and a line from Vinita along the St. Louis and San Francisco Railroad to Red Fork, I. T.

The Dunkirk, N. Y., Home Telephone Company, organized two months ago, and which holds a franchise granted by the common council, will commence work on its new line this week. All equipment has been shipped there, and the poles and wire will be laid and strung in about two weeks.

Work has begun on a new telephone system at Sanford, N. C. The holes are being sunk for the posts. It is proposed by Mr. Will Wynn, who will build the system to connect Raleigh, Greensboro and Richmond, Va., with Sanford. He has lately been making the necessary arrangements for the same.

A long distance telephone will be constructed between Alexander City and Dadeville, and thence to Opelika, Ala. From the last named place the line will be continued to Birmingham in that State.

The Belmont Telephone Company has commenced to place its wires in Bridgeport, W. Va., and it is understood will soon begin to set poles in other places where it has secured franchises.

The Diamond State Telephone Company, which has its main office in Dover, Del., has completed its line through Easton.

The Warren, Minn., Telephone Company's building was entirely destroyed by fire a short time ago.

The Dakota Telephone Company is improving its service in Huron, S. D.

TELEPHONE INCORPORATIONS.

The Cass County Telephone Company, Harrisonville, Mo.—to operate telephone lines. Capital stock, $2,000. Incorporators: W. B. Scruggs, H. B. Moody, Mary Moody, T. W. Clement, Dora B. Scruggs.

The Juniata & Susquehanna Telephone Company, Harrisburg, Pa.—to operate lines in Northumberland, Dauphin, Cumberland, Franklin, Perry, Snyder, Juniata, Mifflin, Huntingdon and Fulton Counties. Capital stock, $1,000.

The Ada Telephone Company, Ada, Minn.—to operate telephone lines. Capital stock, $1,000. Incorporators: W. H Matthews, R. S. Matthews, both of Ada; D. C. Jones, of Gary; D. E. Fulton, of Beltrami; S. M. Calkins, of Twin Valley.

The El Dorado Springs Telephone Company, Kansas City Mo. Capital stock, $10,000. Incorporators: C. A. Ross, A. P. Nichols, H. Brumback, K. Jenney, all of Kansas City; F. W. Hiatt, of El Dorado Springs.

The Quick Telephone Company, Harrisonville, Mo. Capital stock, $20,000. Incorporators: Shem Zook, Isaac Zook, East Lynne; Maurice Quick, Quick City; P. H. Wirt, Harrisonville, and others.

The Harrison Telephone Company of Harrison, O. Capital stock, $5,000. Incorporators: John L. Wallefeld, Alexis F. Burk, Robert P. Burk, John C. Bevis and Francis Nolowell.

The American Messenger 'Phone Call Company, Wilmington, Del. Capital stock, $100,000. Incorporators: E. Everitt, W. S. Kolb, G. Le Maistre, all of Philadelphia, Pa.; G. W. Kimball, of Wilmington.

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GENERAL ELECTRICAL NEWS.

Lighting.

Amboy, Minn.—The citizens of this place are agitating the question of building an electric light plant.

Baton Rouge, La.—R. A. Hart of this city wants prices on a small electric light plant.

Barberton, O.—The city council will advertise for bids for lighting the city by electricity.

Blue Rapids, Kan.—A. E. Winter, secretary of the Commercial Club, is investigating the cost, etc., of putting in an electric light and power plant here.

Burlington, Ia.—Mayor Marquardt and others are investigating the cost, etc., of installing an electric light plant in this city.

Chattanooga, Tenn.—The Consigners' Favorite Box Company of this city is in the market for an electric light plant. Address Box 239, Chattanooga.

Chicago, Ill.—City Electrician Ellicott will ask that $970,000 be appropriated in 1901 for more street lights.

Clear Lake, Minn.—Mr. Mortenson, the owner of the electric light plant at Toronto, has been looking over the field with a view of putting in a plant here.

Cuba, Ill.—This town is preparing to build an electric light plant.

Fredericksburg, Va.—This city has sold $12,000 in bonds for the purpose of building a new electric light plant.

Hickory, N. C.—E. L. Shuford Manufacturing Company of this city invites bids on lighting apparatus for a cotton mill.

Jacksboro, Tex.—The Jacksboro Light & Power Company has reorganized with J. Hessley, president. The company will improve its plant.

Jacksonville, Fla.—The American Kaolin Company, six miles south of here, is preparing to install an electric light plant in its works.

Jerseyville, Ill.—It is reported that a local company has been formed here to establish a new electric light plant. The plant now in operation is owned by St. Louis parties.

Kissimmee, Fla.—W. C. Maynard has submitted a proposition to the city council to install a modern electric light plant.

Larned, Kan.—The electric light plant of this city was purchased by Mr. Henderson. Improvements and repairs will be made by the new purchaser.

Little Falls, N. Y.—I. W. Lovenheim has asked permission to erect an electric light plant here.

Marshfield, Vt.—M. E. Beckley and M. C. Ide have under consideration the putting in of an electric light plant in the Ide factory.

Mayville, Mich.—This town wants electric lights and will give a bonus to any reliable person who will put in a good plant.

Mexia, Tex.—W. S. Gibbs, of Huntsville, Tex., is investigating with a view of establishing an electric light plant here.

Milwaukee, Wis.—The Milwaukee Electric Company is looking for a site and planning to erect a $40,000 plant next summer.

Richmond, Ind.—Consulting Engineer J. B. Nelson, of Indianapolis, has handed in his completed plans and specifications to the council committee on the electric light plant. The establishment and equipment of the plant will cost $150,000 and will be erected at once.

Ripon, Wis.—Bids for 5, 10 or 15 years will be received until January 3 for a franchise to supply electric light for this city. Address F. W. Allen, city clerk.

Rochester, N. Y.—A recent fire wrecked the Citizens' Electric Light & Power Company's plant, entailing a heavy loss.

Sea Isle City, N. J.—A new addition will be erected to the electric lighting plant here under the direction of T. E. Ludlam.

Sparta, Tenn.—The Sparta Telephone Company is considering the erection of an electric light plant here.

South Boston, Va.—The South Boston Electric Light & Power Company with $200,000 capital stock has been chartered by R. W. Lawson, J. J. Lawson and R. S. Barbour, to maintain and operate an electric light plant.

Tillamook, Ore.—This city is to have a new electric light plant. The present plant, which has been running for several years, has outlived its usefulness, and is closed down.

Waynesville, N. C.—This city has decided upon the establishment of a plant for electric lighting. F. W. Miller, city treasurer.

Welland, Ont.—The Welland electric light plant was completely destroyed by fire a short time ago.

Wenona, Ill.—Messrs. Robinson & Fosbender of the Wenona Light & Power Company have gained control of the franchise of the Spring Valley Electric Light Company. The new purchasers will at once make several thousand dollars' worth of repairs on their newly acquired property.

Street Railways.

Barnesville, O.—It is stated that a movement is on foot to construct an electric railroad from Woodsfield to this place.

Beaumont, Tex.—The city council has granted to J. H. Kirby and others a franchise over the streets of this city for an electric street railway system.

Bloomsburg, Pa.—The construction of the Columbia-Montour Electric Railroad in the near future is now an assured fact.

Caldwell, O.—A project for building an electric railroad between here and Beverly is said to be under consideration by some New York capitalists.

Des Moines, Ia.—It is announced here that a syndicate has been formed for the purpose of building an electric or compressed-air railway out of this city to connect with the Iowa Central Railway at Newton.

Erie, Pa.—The Terminal Street Railway Company of this city was recently incorporated to build a trolley line here. The capital stock is $7,500 and C. S. Strong is its president.

Fabius, N. Y.—The Delaware, Lackawanna & Western Railroad is surveying for an electric road from Apulia to this place through to Cuyler.

Hereford, Pa.—A new electric railroad, which will connect with the road constructed from Reading to Boyertown at the latter place, and with the Lehigh Traction Company's line at Emaus will be built in the spring.

Kansas City, Mo.—The fourth cable line has been converted into an electric line in this city during the last two years. There are six cable routes left. Electricity will be substituted on at least two of these lines within the next eighteen months, and the officials are looking forward to the time when they will sell the last cable to the scrap-iron dealer.

Lima, O.—The Lima & Findlay Electric Railway Company of this city was recently incorporated with $20,000 capital stock.

Marietta, O.—A company composed of Eastern capitalists has been organized to build an electric road from this city to Lowell, a point 20 miles up the Muskingum River.

Marshall, Tex.—The city council lately granted to A. R. Wheeler & Co. of St. Louis a 50-year franchise to build an electric street railway and operate the same over streets in this city.

Niles, Mich.—J. W. Van Cleave of New York City, promoter of the Interstate Railway Company, has applied to the council for a franchise to run an electric line through this city. The terminus will be at St. Joseph and the line will run from South Bend, Ind., through Niles, Buchanan, Berrien Springs and Benton Harbor.

Parkersburg, W. Va.—The Baltimore & Ohio Railroad branch between here and Marietta will be converted into an electric line.

South Glens Falls, N. Y.—Hon. Warner Miller, Hon. Warren Curtis and a number of others who own a franchise permitting the construction of a road from here to Palmer, Saratoga County, have had a survey made and are anxious to have the road built.

St. Augustine, Fla.—Atlanta parties have become interested in a plan to build an electric railway in the suburbs of the city and are in correspondence with Mayor Boyce.

West Chester, Pa.—An electric railway from here to Oxford is among the probabilities for next year.

Youngstown, O.—The capital stock of the Youngstown & Sharon Electric Railway Company has been increased from $200,000 to $600,000.

Manufacturing.

Detroit, Mich.—Frederick and Edward Leadbeater and John G. Hacking have incorporated as the Low Water Electric Alarm Company, and will manufacture the Leadbeater electric apparatus for use on steam boilers. The capital stock is $25,000.

Kittery, Me.—President Dallas W. Cobb and treasurer John E. Fuller of Mansfield, Mass., are the officers of a concern recently organized here known as the H. A. Fisher Manufacturing Company, which will manufacture and deal in electrical goods with $10,000 capital stock.

Los Angeles, Cal.—A lately organized concern, known as the Pacific Electrical Works, has purchased land here where a large and completely equipped factory for electrical work, insulation of electric wires, etc., will be in operation by the middle of January next. The company will start operations with a capital of $250,000.

Topeka, Kan.—The Overton Manufacturing Company of this city has been awarded the construction of the new electric light plant here.

Company Matters.

Buffalo, N. Y.—The Franklinville Electric Company has been reorganized and the new company will soon have the plant in operation again.

Jersey City, N. J.—The stockholders of the Cahill Writing Machine Manufacturing Company held their annual meeting at the office of the company in this city recently. They voted to change the name of the company to the Cahill Electric Typewriter Company, and to amend the charter to permit the capital stock to be increased from $710,000 to $1,250,000.

Plano, Ill.—The Plano Electric Light & Power Company has changed its name to the Plano Light & Power Company, and increased its capital stock from $8,000 to $15,000.

Power and Transmission.

Berrien Springs, Mich.—Chas. A. Chapin is about to spend $100,000 in the construction of a dam at Berrien Springs, for the purpose of supplying the South Bend Street Railway Company with power.

San Francisco, Cal.—The Beckwith Power Company has been formed lately with Don Ray, S. C. Denson, William M. Pierson, Charles Ray and Byron D. Beckwith as directors, with a capital stock of $750,000. This company will operate electrical plants and build railways in the Sacramento Valley.

Schenectady, N. Y.—It has been definitely decided that manufacturing concerns of this city will utilize all the power the Niskayuna Power Company will be able to generate at its plant now in process of construction.

Weymouth, N. J.—A syndicate consisting of Philadelphia and New York capitalists has purchased a site along the Egg Harbor River at this place for the purpose of erecting an electric power house to supply Atlantic County with electricity.

Automobiles.

Chester, Pa.—John Welsh, an employe of Messrs. Jenkins & Burk, carriage builders, has constructed a home-made automobile. While the machine is, as Mr. Welsh admits, crude, there is said to be merit in its construction.

Knightstown, Ind.—The Knightstown Buggy Company of this city has filed articles of incorporation with the Secretary of State, with a capital stock of $30,000. Robert Silver, Mason Waller and Robert Logan are the directors. The company will manufacture automobiles in the near future.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Dec 3						
United Traction (Consolidation of the Albany and Troy City Railway.)	100	$5,000,000	$5,000,000	1¾ % Q.,	111	112
Allentown Pa.—Dec 3						
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Dec 3:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Dec 3						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.—Dec 3						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,000	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	113
Boston Elevated R. R	100	10,000,000		2¼ % Aug. 99,	156	157
Brooklyn N. Y.—Dec 3:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	230	232
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	72⅜	72⅛
*c*Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d*Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
*e*Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
*f*Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
*g*Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Dec 3.						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.—Dec 3						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	90	91
Charleston, S. C.—Dec 3						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Dec 3						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	255	260
Chicago & South Side R. T. RR	100	10,323,800	10,323,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9½	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	32	32½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	84½	84¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
*h*North Chicago City RR	100	500,000	249,900	....	197	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99½	100
West Chicago St. RR. Co	100	20,000,000	13,189,000	1½ % Q., Feb.	100¾	100½
Union Traction Ry..........com.	....	1,250,000	624,900	35 %	13	13½
Union Traction Co...........pref.	100	2,000,000	2,000,000	5 % S.	53	55
Cincinnati, Ohio.—Dec 3:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	--	--
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
*l*Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124⅛	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126¼	127
Cleveland, Ohio.—Dec 3:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Dec 3:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	--
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Dec 3:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co................pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Dec 3						
Hartford Street Ry. Co	100	$4,000,000	$200,000	3 % S., Oct.,	150	–
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	–
Holyoke Mass.—Dec 3						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Dec 3						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	–
Indianapolis, Ind—Dec 3.						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	27	29
Lancaster, Pa.—Dec 3						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	–
Lancaster & Col. Electric Ry	....	....	87,500	....	--	–
West End Street Railway	....	....	....	....	--	–
Louisville, Ky.—Dec 3:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	82	83
Louisville Ry..................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Minneapolis, Minn.—Dec 3						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63⅝	63⅞
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	136	137
Montreal, Canada.—Dec 3						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	275⅛	275½
Toronto Street Ry. Co	100	6,000,000	6,000,000	1¾ % S., J. & J. †	109⅛	109¼
Memphis Tenn.—Dec 3:						
Memphis Street Railway Co	100	500,000	500,000	....	25	–
New Haven, Conn.—Dec 3:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	–
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Dec 3						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148⅛	153
New Orleans Traction Co new com.	100	....	....	....	22⅛	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
*a*Crescent City RR............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20⅛	26
*b*New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	--	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Dec 3:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
*c*Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
*d*Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	170½	171
*e*Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
*f*Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
*g*Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
*h*Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
*i*42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
*j*Ninth Avenue RR..........guar.	100	800,000	800,000	....	198	201
*k*Sixth Avenue RR..........guar	100	2,000,000	2,000,000	....	205	225
*l*Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	113⅛	112¾
*m*42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Dec 3:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	59⅞	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	24½	25½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	23	24
Pittsburg, Pa.—Dec 3:						
Allegheny Traction Co	50	500,000	500,000	....	57	58
*o*Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	26	26½
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	62	63
*p*Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	73
*q*Citizens' Traction Co	50	3,000,000	‡3,000,000	6 % A.	72¼	72½
*r*Duquesne Traction Co	50	3,000,000	‡3,000,000	6 % A.	..	...
*s*Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000		5 % A., June	..	..
United Traction Co.............com.	50	17,000,000		J. & J.	15	15⅛
United Traction Co.............pref.	50	3,000,000		J. & J.	50¾	51

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Dec 3						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass.—Dec 3						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Dec 3						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Dec 3:						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Dec 3:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Dec 3						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	*533,900	‡533,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000 000	29,930,450	....	36⅞	37
cElectric Traction Co.	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90⅛
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Dec 3						
Rochester Railway Co.	100	5,000,000	5,000,000	....	20	23
Reading, Pa.—Dec 3						
jReading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	133	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis, Mo.—Dec 3						
Fourth Street & Arsenal Ry	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	..	..
United Electric Ry....com.	50	500,000	500,000	....	19	20
United Electric Ry....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	63	65
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99.	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	50	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Dec 3						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16⅛	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Dec 3						
Springfield Consolidated Ry	100	750,000	750,000	....	---	--
Springfield O.—Dec 3						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Dec 3:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Dec 3						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S. ⅔	109⅛	109¼
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	275⅛	275½
Washington, D. C.—Dec 3:						
Belt Ry. Co.	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.	50	200,000	200,000	....	20	21
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Dec 3						
*Worcester Traction Co....com.	100	8,000,000	8,000,000	....	31¼	34
Worcester Traction Co....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Dec 3:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. ⅔ Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 3						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	158	159
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	108	110
New England Telephone Co	..	10,394,600	10,304,600	$1.50 p. sh. Feb	128	129
New York.—Dec 3						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	170	175
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co. guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		3	3⅛
*New York & New Jersey Tel. Co..	100	5,000,000	3,728,000	2½ % Q., Jan.,	160	168
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99.	83	83¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Dec 3:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	37
Bell Teleph. Co. (of Canada.)	100	8,960,000	8,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	60	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	......	......	....	96½	97
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 3						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	--
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	166⅞	167
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	28
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	51¾	52
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	64	65
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Dec 3						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co....com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	166⅞	167
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	....	41	--
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Dec 3						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	800,000	800,000	Q	--	--
Philadelphia, Pa.—Dec 3						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	90	93
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	92	97
Northern Elec. Light & Power Co..	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Dec 3						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	175	176
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98½	99
Rhode Island Elec. Protec. Co.	100	......	......	....	118¾	120¼
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q ‡	206¼	206½
Toronto (Canada) Elec. Light Co..	100	1,085,000	1,085,000	1¾ % Q	185½	186½
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Dec 3:						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$8.50 p.sh.	--	100
New York.—Dec 3:						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co....com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co....pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Dec 3						
Electro Pneumatic Trans. Co	10	1,500,000	......	---	3	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	---	..	162
Welsbach Commercial Co....com.	100	8,500,000	......	---	20½	21½
Welsbach Commercial Co....pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	48	43½
Welsbach Light Co., Canada.	5	500,000	......	....	1	1½
Pittsburg, Pa.—Dec 3						
Carborundum Mfg. Co	100	200,000	200,000	....	--	
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	209	210
Miscellaneous.—Dec 3						
*Barney & Smith Car Co....com.	100	......	1,000,000	---	18	16
*Barney & Smith Car Co....pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	82	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co	100	......	......	---	105	109
*Pratt & Whitney Co....com.	100	......	......	---	2	4
*Pratt & Whitney Co....pfd	100	......	......	---	40	50
Stillwell-Bierce Co....com.	--	......	....	---	--	50
Stillwell-Bierce Co....pfd.	--	......	......	2 % Sept 1, '99.	50	65
Shultz Belting Co	100	500,000	......	....	88	90
St. Charles Car Co		......	......	......	98	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117⅛	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co.................1st 5s	....	....	1942	......	*116½	......

†Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co..........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR..........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry.............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry..............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4½s.	1,500,000	750,000	1907	J. & J.	....	.....
‖Chicago West Div. Ry......1st mtg 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	.	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry..........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

†Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co.......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Dec 3 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J.&D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M& N	109	......
Winhester Avenue RR......Deben. g. 5	100,000	94,000	1912	M& S	......	....

New Orleans La.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.....cons mtg. 6s.	$150,000	$150,000§	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	......	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	......	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000.000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	......	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5%.	100,000	1,100.000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6%.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200.000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry...............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	350,000	350,000	1919	......	110½	112½
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	123½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.		
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M & S.		

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry...........1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	..
Empire Pass. Ry.....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	..
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	..
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	...
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.		..
People's Pass. Ry...................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	..
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	367,000	1912	M. & S.	....	...
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co.........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	.....
Thirteenth & 15th St. Ry.........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	..
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col. tr. 4s.	29,785,000	29,724,876	1945	A. & O.	——	......
West End Passenger Ry.......1st mtg. 7s.	....	......	1905	......	....	...
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	...
West. Phila. Pass. Ry.............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Dec 3 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co..........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	.
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	..	.....
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	.....
Second Ave. Traction Co.....................5s.	2,500.000	2,032,000	1934	J. & D.	......	...
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1918	M. & S.	......	..

Providence R. I.

Date of Quotation—Dec 3, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	....
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000.000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Dec 3, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	000 000	191	J& J	17	

*With interest. *Unlisted.

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation— Dec 3, 1900.						
Jefferson Avenue Ry.............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co..............1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‡People's RR. Co.....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co...............Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	3,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
§$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation— Dec 3. 1900						
Belt Ry. Co..........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..........................1s mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. 1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation— Dec 3, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,866,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	......
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s	3,000,000	2,878,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N. J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry...................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. St. RR. Co.						
‖$87,000 in treasury.						
§$960,000 res'ved to redeem prior liens.						
††$620,000 in escrow.						
					*With int'res	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass.						
Date of Quotation—Dec 3 1900.						
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation— Dec 3, 1900						
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Dec 3, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,312,000	4,312,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 3, 1900.					100½	101
American Bell Telephone......................4s.			1908	F. & A.	......	....
Northwestern Telegraph Co..................7s.	....	....	....	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	....	....	......	114	115
Chesapeake & Potomac Teleph. Co....5s.	....	......	1911	J. & D.	103	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 3, 1900						
American Electric Heating............. 7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co.............	....	....	......	......	......	25
Barrney & Smith Car Co.........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

Unlisted †Nominal

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c. casting, 16⅝@16¾c.

The owners of the Knoxville, Tenn., Traction Company purpose to spend $2,000,000 in a local street railway, electric light plant and coke plant.

The Chicago City Railway Company has declared a dividend of 3 per cent., payable December 31. Books close December 15 and reopen December 21.

At the annual meeting of the stockholders of the Metropolitan Street Railway Company held in New York on Monday the present directors were re-elected.

The directors of the Telegraph, Telephone and Cable Company have passed a resolution assessing the capital stock 10 per cent., or $5 per share, payable December 31.

Holders of temporary certificates for the stock of the Consolidated Railway Lighting and Equipment Company may receive their stock on presentation of the certificates to the Morton Trust Company, New York City.

At the annual meeting last week of the West End Street Railway Company of Boston, Samuel Little was succeeded on the board of directors by C. M. Baker. Mr. Little also resigned the presidency of the road in favor of director Joseph B. Russell.

President Vreeland of the Metropolitan Street Railway Company and agents of a number of railroads and steamboat lines centering in New York are discussing the advisability of a new surface line which shall make direct connections from the Grand Central depot to the ferries of the Pennsylvania, Erie and Baltimore & Ohio.

The consolidation of street railways, under the title of the Worcester Consolidated Street Railway Company by the Old Colony Trust Company of Boston, now includes the Worcester Traction Company, Worcester and Marlborough, Leominster and Clinton, and the Worcester Suburban lines. The Worcester Traction Company securities will be retired.

All the trolley lines in Elizabeth, Rahway and Plainfield, N. J., with the exception of the North Jersey system, have consolidated under the name of the Elizabeth, Plainfield & Central Jersey Railway Company. The new company has about 60 miles of track, its capital stock will be $3,000,000 and $2,500,000 bonds are authorized. David Young has been elected president, and Thomas A. Nevins vice-president.

The Massachusetts Electric Companies has declared a dividend of $2.33 on the preferred stock, payable January 1 to stockholders of record December 15. The additional ⅓ per cent., is not in the nature of an extra dividend, but represented the amount which shareholders would have lost under the new policy of paying dividends on January 1 and July 1 instead of June 1 and December 1, if it had not been made up in this way.

The consolidation of the Brockton and Plymouth Street Railway Company, the Pembroke Street Railway Company and the Plymouth and Kingston Street Railway Company of Massachusetts is now complete. By consolidating these three roads, the first two of which have been recently constructed, the new Brockton & Plymouth Street Railway Company has a through line from the lines of the Brockton Street Railway Company to Plymouth. The company is at present capitalized for $270,000.

The Electric Storage Battery Company of Philadelphia has declared a cash dividend of 6 per cent. on the preferred stock, being the accumulations in this stock to January 1, 1901, payable January 2. Books close December 20 reopen January 3. The company also announces that the policy is to now maintain the full regular rate of 6 per cent per annum to which the preferred is entitled, which also entitles the common to receive 6 per cent. per annum. Beginning April 1, 1901, therefore, quarterly dividends on both stocks will be announced at the rate of 6 per cent. per annum.

To absorb all gas and electric light companies in Westchester County is the purpose, it is said, of "The Westchester Lighting Company," which has been formed in that county. Simultaneously on December 1 certificates of the increase of capital stock of the company from $2,500,000 to $12,500.000 were filed in Albany and in the White Plains Clerk's office. The certificate says that of this sum, $10,000,000 is common stock, consisting of 100,000 shares of the par value of $100 each, and $2,500,000 is preferred stock of the same par value per share. Directors of the new trust comprise Charles H. Werner, Louis B. Grant, Richard F. McKirney, M. J. Werner, Charles M. Hemingway, N. D. Daboll, Henry A. Kenworthy, Charles W. Squires, W. W. Scrugham and Reginald H. Giles. The papers were drawn up by former Lieutenant Governor Sheehan. It is said the new corporation proposes to erect several extensive plants through the county as soon as it obtains new franchises and rights in White Plains, Yonkers, Mount Vernon, New Rochelle, Pelham, Port Chester, Rye, Harrison, Mamaroneck, Tarrytown and Peekskill, N. Y.

Kuhn, Loeb & Company, announced on December 1, that on December 7 they would receive subscriptions, at 104½ and interest, for $10,000,000 of the Third Avenue Railroad Company's first consolidrted mortgage 4 per cent 100 year gold bonds. These are part of a total authorized issue of $50,000,000 of which $35,000,000 were purchased by Kuhn, Loeb & Company last spring, leaving $15,000,000 unissued, of which $13,433,000 are reserved to retire outstanding issues. The fixed charges of the Third Avenue Company and its controlled companies, inclusive of the issue of $35,000,000 of the new bonds authorized, amount to $2,095,689. It is estimated that after the completion of the electrical equipment now in progress and with the economies resulting from the close connection with the Metropolitan Street Railway Company, the annual net earnings of the Third Avenue Railroad will be at least $3,000,000. This, together with the surplus earnings of the Metropolitan Street Railway, after deducting its own fixed charges and taking as the basis the results of the last fiscal year, would provide net earnings of nearly $6,500,000 to meet fixed charges, amounting, as above stated, to about $2,000,000 in all.

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ELECTRICITY.

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EDITORIAL NOTES.

"Electricity's" Educational Series.

In this issue will be found the fifth article of our educational series, entitled "Storage Batteries." This article needs no commenting on as it speaks for itself.

This series so far has proven a success, judging from the number of subscriptions we are daily receiving from as far West as California, and as far South as Texas. As we anticipated, there is a demand among practising electricians for articles of a practical nature that explain in a simple and clear way the problems that have taken such men as Maxwell, Lord Kelvin and others years to solve. Such a series we have been fortunate in being able to present to our readers, and are gratified that it has met with universal approval.

* * *

Developments in Wireless Telegraphy.

Various developments have taken place in wireless telegraphy of late, which may in the near future make that method of transmitting messages invaluable to the commercial world. We refer among other things to the improvements Mr. Marconi has made in his transmitter and receiver. He has done away with the vertical wires, substituting low cylinders for them, and with this new arrangement has succeeded in sending messages over considerable distances. The transmitting of a message over ninety miles is no longer considered an achievement of note, as may be inferred from a recent report of the United States Consul at Brussels to the State Department. A station has been established at La Panne, Belgium, for the exchange of wireless telegraphic messages between Belgium and England. The Dover-Ostend mail boat Princess Clementine was fitted up with temporary apparatus for use in experimental trials. The test showed that messages could be transmitted with the same regularity and celerity as ordinary telegrams. Various messages were sent from the vessel to Ostend, Brussels, Dover and London, and the reception of each was acknowledged promptly. Subsequently, the Consul adds, a message was sent from the vessel to the station at Dover Court, Essex, a distance of almost ninety miles, including many miles of cliffs and sea.

The most startling development, however, is the statement recently made by one of Mr. Marconi's assistants, that inside of a year it would be possible to transmit wireless messages across the Atlantic. This, it is claimed, will be possible owing to improvements made by Mr. Marconi in his apparatus. A full explanation of his alleged new discovery has not yet been given out, but the Italian inventor is said to have announced positively that it is entirely successful, and that all submarine cables will be done away with, and the cost of ocean telegraph messages reduced to a nominal sum.

As might be expected such an announcement is something of a surprise, and has had the effect of somewhat dampening the ardor of the advocates of the Pacific cable project. If Mr. Marconi can in the course of a year or two so perfect his apparatus that it will be possible to send wireless messages two thousand to three thousand miles, what is the use of having Congress appropriate some $12,000,000 for a submarine cable to the Philippines, when a set of Marconi instruments may be procured at the most for $10,000? This is the question that is being asked.

Although we have no desire to appear pessimistic, it is a well-known fact that a child has to learn to creep before it can walk, and that this same principle applies to every great invention that has ever been brought out. Improvements in the telephone, the locomotive, the dynamo and almost everything else were made gradually and slowly and not by leaps and jumps, and in our opinion wireless telegraphy will be no exception to the rule. As one hundred miles is about the longest distance over which a wireless message has ever been sent after years of labor, it is scarcely likely that one year, two years, or even three years, will see this distance multiplied by twenty.

* * *

Two Thermal Storage Systems.

The New York & Putnam Railroad is about to try an alleged new system of storing power. While the details have not been made public it is known that in a general way the process consists of a method of subjecting water to a high pressure, while heat is being applied, and making use of the superheated steam thus generated for propelling cars. The daily press hails this scheme of storing power as a wonderful new invention, whereas, from the information at hand, this process differs little from that known as the Halpin storage system, made use of at Shore-

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ditch, London, and which was referred to in these columns as far back as August 25, 1897.

The objective purpose of these two methods of storing power differs entirely. As stated above, the system about to be made use of in this country is intended for the propulsion of railway cars, thus doing away with the present locomotive, fire-box and tender. This is to be accomplished by means of specially devised motors on the cars, and by an ingenious arrangement by which the superheated water is released drop by drop from a reservoir under the car into a high pressure cylinder, where, owing to the pressure being removed, it bursts into steam and operates a piston.

The Halpin thermal storage system, on the other hand, is made use of in England in connection with refuse destructors for storing power during the day when the steam and electrical plant is not in operation, in order that the energy in the form of steam may be utilized during the night at any desired rate. It might be in place to state that the energy thus obtained is made use of in most cases for operating engines and dynamos to obtain current for lighting purposes.

Mr. Halpin has proposed three systems, which are severally known as the "steam storage," "feed storage," and "combined feed and steam storage," in all of which he employs large iron storage cylinders filled with water brought to the same temperature as the water of the boilers by means of connecting pipes between the two through which a constant circulation is kept up.

In the steam storage system he employs only sufficient boiler capacity to supply the mean demand on the station and storage tanks sufficient to supply the maximum demand. The boilers thus work continuously at their most economical rate, storing up heat in the tanks during light load in sufficient quantity to take care of the excess demand at busy hours. The water thus heated, when fully charged, is under a pressure of 265 pounds per square inch, which corresponds to a temperature of 406° F.

Thus it will be seen that the thermal storage system, which has been made use of in England for several years, does not materially differ from that recently tried on the New York & Putnam Railroad, except in the use made of the steam.

* * *

Features of the South Carolina Interstate Exposition.

Among the many and attractive displays at the coming South Carolina Interstate and West Indian Exposition to open in Charleston on December 1, 1901, and extend into the middle of the following year, will be the electrical display, exhibits and equipment.

It is the intention to beautify the already natural beauty of the landscape in every way possible, and in order to aid in this matter electricity will play no inconsiderable part. Among other features an artificial lake will be constructed, and in this lake will be the electrical island, upon which will be erected the Palace of Electricity, one of the most unique and effective of structures, with an electrical fountain, cascades and every known modern appliance of electricity which can be utilized for the purpose.

One of the buildings has already been completed, and although it was designed and erected in a very limited space of time, yet it is perfect of its kind, rich in coloring and harmonious in outline, admirably adapted not only for the immediate purpose for which it is to be utilized, but also for its final destiny as one of the brightest ornaments of the Exposition. It is in the form of an octagonal booth, the framework composed of light malleable iron, the exposed surfaces inside and outside of the building being filled in with beautifully inlaid mosaics of rare marbles, onyx and glass. The dome of the booth is of leaded glass, representing in colors the globe of the western hemisphere, Charleston being indicated by a blazing jewel of light. Below this dome is a frieze of jewelled glass, containing typical motifs in swags and arabesques, which, like the dome, is lighted from within by electricity, the whole being supported upon eight strong, graceful columns and arches of inlaid mosaic. Above the capitals of these columns are beautifully molded swans, with extended wings, the shining globe, with its dividing lines of longitude and latitude, and these winged creatures together inevitably suggest a floating and moving spirit, the entire structure being symbolic of light, motion and progress. Viewed from within or without, this little building is equally radiant and transparent. Between the glass sides of the columns and the frieze, as well as in the dome are myraids of concealed electric lights, throwing out a prismatic halo, while, still further to enhance the beauty of the effect, sprays of water play around the dome, frieze, columns and arches, affording a constant kaleidoscopic change of color and form.

Within this booth a fountain of onyx and glass rises from a strong, substantial base, the figures on the pedestal representing the triumph of electricity over water power. The cylindrical shaft copies, in conventional lines, the trunk of the palmetto, and at the top of this column a beautiful statue of Columbia stands upon a large mosaic ball, amid a cluster of palm leaves. This statue is supposed to be typical of the New South. In one hand she holds a distaff, outlined in flashing currents of electricity, and suggesting the cotton industry, while in the other hand she bears a dazzling arc lamp, which typifies the light of progress. Below the water line of the fountain and the sprays of water which are cast up from the grotesque projections, like the gargoyles of mediæval architecture, are mirrors and lights which duplicate, with magical effect, the radiant coloring and enchanting lines of the dome and columns. Both the booth and the electrical fountain are so constructed that they can be taken to pieces and shipped from one place to another if necessary.

It is stated that President McKinley's proposition for an accurate determination of the meridians of the Yukon, is made feasible owing to the construction of telegraph lines in that region by the Canadian Government. A line from Ashcroft to Atlin, British Columbia, was started last summer, and will be finished next spring. It connects with a line from Bennett to Dawson, which was strung last year. From Dawson, the line has been extended to Forty Mile Creek. These telegraph facilities permit the accurate determination of longitude. The matter is one of the exhange of time. Between Ottawa and Vancouver the time was fixed some time ago. Vancouver will form a basis for exchanging the time with some northern point in the Yukon, and when that is done, the time between such northern point and the capital of the Dominion can easily be exchanged. The astronomers will then get the difference of time between Greenwich and the Yukon, or in other words, the longitude.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The Roentgen Society of the United States will hold its first regular meeting in this city, on December 13 and 14, at the Academy of Medicine, 17 West 43d street. A number of interesting papers will be read and discussed. Dr. S. H. Monell, 47 West 27th street is chairman of the committee of arrangements.

Consul Hughes at Coburg, Germany, makes a report to the State Department at Washington, D. C., in regard to the various attempts that have been made in Germany to devise a means to counteract the destructive influence exerted by the passage of heavy electric tram-cars upon asphalt pavements. "Hitherto," he says, "these endeavors have been without definite results, but that much has been said lately in praise of a system which is shortly to be subjected to a practical test in Berlin. Contrary to ordinary practice," continued Consul Hughes, "in which the tram rails are laid immediately upon a foundation of concrete and in direct contact with the superimposed asphalt, the new method consists in laying the rails upon a bed of coarse gravel and running a line of hard wood blocks along either side. Experience has shown that ordinary pavements, with gravel and stone foundations in place of concrete, offer the greatest resistance to the influence of electric cars. It is assumed that the gravel or stone allows the rails more play, which is advantageous in that despite great care in their manufacture, it is impossible to insure exact uniformity in the gauge of the cars. The new method is also relied upon to reduce the noise caused by the cars running over the lines."

An Ohio man is evidently making good use of his electric automobile having arranged it so that when he comes in from a trip he can quickly make connections and light his stable from the auto's batteries.

Prof. V. L. Emerson, of Ottawa, Ont., has just completed the invention of a new incandescent light. Generally speaking, it is a hydrocarbon light in which each burner is independent and so arranged that the heat generated in burning becomes the agent which produces the gas that sustains the light. Kerosene oil is carried through a small hollow wire to the burners which may be attached to ordinary gas fixtures. The lamps are handsomely made of burnished copper and the oil is completely sealed in bulbs of the same material. The apparatus can be handled without the slightest danger of explosion, is portable and self-contained. Several different systems of this new light have been completed. The burners are so arranged as to force in air that, when combined with liquid carbon, a mixture of gas capable of great heat and lighting power is produced. The system has been adapted to street, factory and dwelling house lighting, also to cooking and heating purposes.

One of the schemes which will come before the British Parliament next year contemplates the construction of a tunnel under the Solent

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from a point near Hurst Castle to the Isle of Wight. An independent company, powerfully backed, it is said, has the enterprise in hand, and the bill which comes before Parliament seeks, first of all, powers to construct a railway from a point in the parish of Sway, on the Brokenhurst and Lymington line, to the Solent. From Hurst Castle the new railway will, by a gradual descent, reach the tunnel, which for the first portion will be constructed of tubes, larger but similar in design to those on the electric railways of the English metropolis. Later on, as the railway gets well below the sea-bed, the tunnel will be of brick and cement.

ACCORDING to the London "Electrical Engineer," the "West Sussex Gazette" is responsible for the following interesting note: "What is a 'milking booster?' Some members of the Worthing Corporation are curious to know. They have ordered two for their electric light undertaking, and don't believe in buying pigs in pokes. The chairman of the special committee was asked for a definition. He says a 'milking booster' occupies the same position at electric lighting works as champagne at a public dinner. A prominent teetotaler who sits on the council thinks that, if such is the case, the town might spend its money much more profitably than on 'milking boosters.'"

A WRITER to the London "Times" of November 29, relates the following entertaining incident: "At the Zoological Gardens on Saturday I witnessed an unrehearsed incident in animal life which is, perhaps, worth noting. A large electric eel was swimming in its tank with more activity than usual, these being generally sluggish creatures, when one of the big foreign cockroaches now established as a kind of pest in the houses where a high temperature is maintained dropped into the water. It began to swim vigorously across the tank, spreading out its wing cases and making a disturbance on the surface of the water. The eel turned round, swam past it, discharged its battery at about 8 inches off, and the cockroach instantly stopped stone dead. It did not even move its antennæ after. The eel afterwards swallowed it, though I imagine that cockroach, even when electrocuted, cannot be palatable. But it is not a little curious that a fish weighing at least 12 pounds, should choose to fire its heavy artillery at an insect 1¼ inches long instead of swallowing it sans facon.

AT the present price of coal, says the "Oesterreichische Zeitschrift fuer Berg und Huettenwesen," the use of turf as fuel commands our special attention. Hitherto all attempts to use turf as fuel and for the production of gas on a large scale have failed, for the reason that no means existed to dry it cheaply and quickly, nor could it be pressed into a small volume. Turf contains about 75 per cent. of water, of which it loses very little in ordinary "drying." It is now proposed to reduce the turf to pulp and destroy the fiber after which the mass is easily dried, getting quite hard and furnishing an excellent charcoal.

A SECTION of the Italian Adriatic Railway is, says the "Colliery Guardian," London, about to be worked by polyphase motors, the current to be delivered to the motors at a pressure of 3,000 volts. The power station will be at a fall on the River Adda, where electric currents will be generated at 20,000 volts three-phase alternating, and transformed at stations on the line to 3,000 volts, and delivered to the motors from double-trolley wires overhead in the usual way. The currents will be worked at a periodicity of fifteen per second; that is to say, there will be fifteen complete cycles per second, as against 40 to 100 cycles common in England, and twenty-five at Niagara Falls. The lower frequency of the alternations will give greater economy, but it will cause any lamps which are on the same circuit to wink. Probably a special provision will be made for this. The railway is apparently to be worked on the independent unit system, in which each car carries its own motor, as against the plan adopted on the London electric railways of placing all the power on a separate locomotive car. Each car will have two three-phase motors of 150 horse-power.

THE Department of Bridges in Brooklyn, N. Y., has lately put in a new capstan at the Washington avenue bridge, crossing Wallabout Creek. This will do away with all the trouble which boats have experienced in the past in getting through the draw because of a heavy current on an ebb or flood tide. Electricity has been substituted and will be used as a means of pulling the boats through the creek at this point.

A LONDON contemporary states that the Roumanian Electric Company has commenced to transmit power to the Bustinari and Campina oil centers from its central electric station at Sinaia, Roumania. During the past month, four of the oil wells of the Steana Romana Company have been worked by electric power. The line pressure is 11,000 volts. At Campina the current is transformed down to 500 volts, and distributed to the motors. The experience of the last month has proved so satisfactory that the Steana Romana Company has decided to alter its entire installation and to replace steam engines with upwards of 100 motors. They estimate that the substitution will cost about 2,000,000 francs, that the cost of working will then be reduced to one-half, and that the saving of time will amount to 33 per cent. Another and very important advantage that will accrue from the substitution is the reduction of the risk of firing the wells, a risk always accompanying the employment of steam boilers near wells which may spout.

MR. R. W. ALLEN, of Queen's Engineering Works, Bedford, England, on his return from a recent trip through this country writes to the London "Times" as follows: "I visited most of the principal electric construction companies, engine builders, tool makers, locomotive works, steel works and electric power plants, and in every case and everywhere I saw how far and away advanced they are over us in methods of construction, design and magnitude. One electric power station in New York alone has 66,000 hp., and their success is due to the extraordinary care and attention which are given to every minute detail, not one point being missed. . . Unless we radically alter and improve our system generally, we shall be left far behind. . . . It is not only in engineering we are behind; it is the same story in many branches of industry. . . . If the British employer would only admit that he is beaten, endeavor to reorganize and make a fresh start, I believe we might yet hold our own and regain much of the lost foreign trade."

ELECTRICITY is rapidly replacing steam and compressed air in mines all over the country. One after another is taking up that kind of power, and it seems as if within a short space of time most of the underground work would be carried on by electric force. There is no doubt of its cheapness for drills as compared with the other kinds of power, and it certainly is much more convenient. To bring steam or compressed air to the heading of tunnels sometimes many hundred feet underground, it has been necessary to build long pipe lines, and to meet with delays through broken joints and many other accidents which are likely to happen to pipe lines. On the other hand, the electric-power wires are flexible, do not require to be laid in any particular way, and are always ready for use,

AMONG the many electric novelties is a small clock mounted on a wooden box containing a storage battery. Set in the top of the box in front of the clock is a tiny electric lamp with a switch handy. Whether the clock is placed at night on a stand by the bedside where it can be reached by stretching out a hand, or whether it is left on a mantel, a turn of the switch throws a bright light on the face of the clock, whenever it is desired to know the time. The storage battery contains a supply of electricity sufficient to last for months.

The "Paris Figaro" states that a project exists for constructing a moving platform on the right bank of the Seine. It will be underground and its length will be about ten kilometers. The route proposed passes under the Avenue de l'Opéra, the great boulevards, the Boulevard Sébastopol, the Rue Turbigo and the Rue de Rivoli. In place of the three platforms now existing at the Exposition the new scheme embraces four. The first, as at the Exposition, will be stationary, the second will have a velocity of 1.50 meters, the third 3 meters, and the fourth 5 meters. Thus a very rapid means of transit a-foot will exist in that portion of Paris, now the most encumbered by vehicular traffic, for as all locomotion will be in one direction a person walking fast on the fourth platform, having no adverse stream of pedestrians to avoid, will easily be able to do more than ten miles an hour.

The New York Electrical Society.

The 210th meeting of the Society will be held at the College of the City of New York, 23d street and Lexington avenue, this (Wednesday) evening, December 12, at 8 o'clock.

Dr. Samuel Sheldon will lecture on "Electrical Measurements of Precision."

This lecture will include: 1. Recent improvements of methods for measurements of precision. 2. Distinction between commercial measurements and those of precision. 3. Distinction between absolute measurements and those of comparison. 4. Present standards. 5. Methods of comparing standard resistances of all magnitudes. 6. Methods of comparing EMF.'s 7. Current measurements, 8. Standard luminants and their comparison. The following standards will be exhibited: 1 ohm, 0.01 ohm, Reichsanstalt Clark cell, Carhart cell, Reichsanstalt compensation set, Hefner-Alteneck lamp, improved Lummer-Brodhun photometer screen. After Dr. Sheldon's lecture, some remarks will be made by the President on "Lighting at the Paris Exposition," with some night views.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 5.

STORAGE BATTERIES.

In article No. 4, we took up primary batteries and in a general way gave an account of the conditions productive of electricity by chemical action. We will now talk for a while on another style of batteries, called secondary or storage batteries; these are also productive of an electric current by chemical action but the conditions necessary for this are first made or produced by electricity.

Although storage batteries have been in practical operation for a number of years they are as yet not clearly understood by the general public. As a matter of fact the opinion prevails to a great extent that a storage battery is some kind of box or jar where electricity is stored up and let out and used as required. This misleading impression is to a considerable degree due to the name "storage" which would seem to imply that the actual current was stored in some manner. I have met men working in the electrical business who could give no other explanation than that the original current was contained in the cells.

Storage batteries produce electrical action by chemical action but the condition which is productive of or governs that chemical action is first produced by electrical action.

To explain in a simple way the action of a storage battery let us take for an example a gravity battery (explained in article 4) that has been almost entirely worked out and connect to it a circuit over which a current is flowing so that the current will flow through, the cell in an opposite direction to the current produced by the cell itself. In other words, connect it so that the current will flow through the cell from the copper to the zinc. This current passing through the battery will do work, it will separate the zinc, which as it were is diffused in the solution, and deposit it as metallic zinc on the zinc plate of the cell. This is just a reverse action to that which goes on when current is being used from the cell, for in that case the action deposits pure copper on the copper plate while the zinc is being wasted away. Now you see the tendency is, in sending the current through this cell, to restore the original condition of it, or, in other words, counteract the conditions going on and produced when current is being used from it. Now the energy of the charging current is used up in producing a condition that will in turn generate electrical energy. This is just what occurs in a storage battery when it is subject to charging and discharging operation. Of course the storage battery as we know it to-day has different elements than those we just spoke of in the gravity battery, as they, used in this way, would not give very efficient results, although serving as our illustration.

Commercial storage batteries are usually made with lead plates immersed in dilute sulphuric acid. The chemical action which goes on in these when current is being passed through the cell or used from it roughly consists in transferring oxygen, which exists in oxide of lead, from one plate to the other. The plates are generally arranged in such a manner that they will contain a great amount of oxide of lead. This is frequently accomplished by perforating the plates and filling the perforations with a paste which consists of lead oxide moistened with sulphuric acid. Sometimes the oxide is formed by charging and discharging the cell a number of times; this process is called forming, and plates made in this manner are often called Planté plates after the original inventor of the lead plate storage battery who used this method of forming the cell.

To procure a large amount of capacity in a cell a number of positive and negative plates are placed in it alternately and connected in parallel, that is, all the positive plates are connected together ending in one terminal while all the negative plates are connected together ending in another terminal. The result produced by this means is that the current producing capacity of the cell will be equal to the individual capacity of each plate multiplied by the number of plates. Do not confuse the current capacity of a cell with the pressure, because the voltage does not depend upon the number of plates, but remains the same regardless of how many are used and only the capacity in current is effected by adding additional plates or increasing the size of the cell.

The electro-motive force or pressure of a lead plate cell varies from slightly below two volts to slightly above depending upon the condition of the charge. The negative plates in this style of a battery have a grayish color and the positive a deep brown when in normal or proper condition.

The storage battery just described although not the only kind known is the type most generally used and the one with which most electricians are familiar.

The use and care of the storage battery is we consider of a great deal more importance to the average electrician than the details of the chemical combination. We believe that a much greater percentage of the troubles and bad results encountered by the use of these batteries is due more to inefficient and incompetent maintenance and care than to their make or construction. Being convinced of this we will now take up the instructions necessary to be followed in setting up and maintaining a "bank" of these batteries.

When setting up a battery or set of batteries place the elements properly in the jars using great care to see that the insulating rings or bushings which separate the plates are in their right place and properly secured. When this is done the acid may be added, first making sure that it is of the proper density by using a hydrometer, which if the solution is correct and contains the proper proportions of sulphuric acid and water, would indicate 1,200 degrees specific gravity. After the solution is added to the cells if it be measured again with the hydrometer, it will be found to have dropped from 1,200 degrees to about 1,180.

The battery should not be allowed to stand but the charging current should be applied at once and in such a way that the positive conductor of the charging circuit be connected to the positive terminal or plates of the battery. The rate of flow must of course be governed to conform to the size of the cell being charged and the instructions supplied by the company who manufactured it followed in this respect. However if this is not furnished divide the current capacity of the cell by twenty, which will give approximately the normal or safe rate of charge. The charging should be continued until the potential will have reached 2½ volts per cell. The specific gravity of the solution, which fell shortly after the cells were filled, should now have reached about 1,200 degrees and at this point the charging rate should be reduced about one-half and continued until the voltage of the cell, or each cell, again reaches 2½ volts. When in this condition the regular service of the battery may be commenced, and on subsequent charges the voltage should be brought up to 2.6 per cell when charging at the normal rate, or if only charging at half that rate they should be brought to 2.5. Understand that the voltage in all these cases should be taken while the charging current is being applied.

When using current from a battery it should never be allowed to get below 1.8 volts per cell and then should not be permitted to remain in that condition any length of time but the charging current should be immediately applied.

GENERAL INSTRUCTIONS

Voltage is not the only indication of the condition of charge of a cell, one that is fully charged will gas or "boil" violently when charging at the normal rate.

When fully charged the specific gravity should be no less than twelve hundred degrees after the charging has been discontinued.

In a cell of good condition the positive plate should be of a deep brown and the negative of a bluish lead color.

Lack of charging if continued long enough will result in sulphate forming on the plates which is indicated by white patches. In this condition no time should be lost in applying the charging current and allowing it to continue, after the cells are apparently fully charged, at about half rate until the sulphate entirely disappears.

Always add pure water to the solution to make up for loss by evaporation, which however should not be added in large enough quantities to reduce the specific gravity to any considerable extent. The solution should never be allowed to get below the top of the plates.

Where a number of cells are used, voltage and specific gravity readings of each cell should be taken quite frequently so that any variation from the proper figure, of any individual cell may be noted and the remedy applied. About the only form of trouble that is likely to occur in an individual cell, in a bank of cells, is a complete or partial short circuit between the positive and the negative plates. This will be indicated by low voltage and low specific gravity and should be at once remedied. The most probable cause of this condition is the lodging between the plates of some foreign article or a loosened part of the plates themselves. Generally speaking a cell may be considered fully charged when both the positive and negative plates have been gassing freely for 15 or 20 minutes.

To prepare dilute sulphuric acid, always pour the acid into the water, never the water into the acid.

It is very advisable to have glass covers placed on the tops of all cells, as a very large proportion of the evaporation will condense on the glass and drop back into the solution. It will also prevent to a great extent so much gas accumulating in a battery room, which makes

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the maintenance of a heavily worked set of batteries so objectionable.

To discontinue the use of a battery or take it out of service, first charge it fully then siphon off the acid, filling each cell with water as soon as it is empty. When all are full of water discharge the battery at the normal rate to less than one volt per cell, then remove the elements from the water and allow them to dry.

POINTS FOR REVIEW OF ARTICLES 4 AND 5.

What is polarization of a battery? What prevents it.

Why is carbon used in some primary batteries instead of copper?

What are three ways of preventing polarization?

How do you find what the normal or safe rate of charge of a storage battery should be?

Why are a number of plates placed in a storage battery and connected in parallel?

Explain the difference between secondary batteries and primary batteries.

Article No. 6 will be entitled "A Day With a Wireman".

PRACTICAL METHODS OF OVERCOMING THE VIBRATIONS CAUSED BY MOTORS.*

BY SHERARD COWPER-COLES.

About two years ago the writer's attention was drawn to the question of finding some means for running motors, dynamos and motor transformers in upper floors of buildings without causing any noise and vibration, as several actions had been brought against tenants of flats and offices for causing noise by the running of motors.

A number of experiments were tried, using felt, rubber buffers and washers, cork, and felt

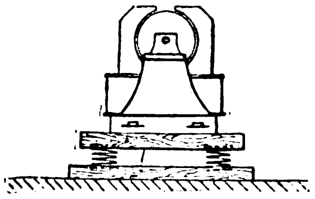

FIG. 1.

interleaved with lead. Placing the motor on a thick bed of sawdust or coffee husks, or some similar soft and comparatively elastic material was also experimented with. None of these methods were found to entirely remove the nuisance but only to reduce it.

Placing the motor on springs, as shown in Fig. 1, was then tried, and this was found to be entirely satisfactory. The machine was not bolted to the floor, but the wood frame on which it was placed was merely allowed to res on the springs, suitable recesses being cut to prevent lateral movement. The experiments were first of all made on a 1½ hp. motor, run at a speed of 1,450 revolutions per minute, used for driving light machinery in a room over some residential flats and offices, on a badly constructed wooden floor. This machine was mounted on springs, as shown in Fig. 1, and a heavy weight was placed on the motor, so as to counteract the pull of the belt. The motor has been running daily, and not a single complaint has been received since this system was adopted. Heavier motors have been mounted as shown in Figs. 2, 3, 4 and 5, and small motor transformers are suspended on springs, as shown in Fig. 6.

Since writing the above, the author's attention has been called to a paper read at the Engineering Conference of the Institution of

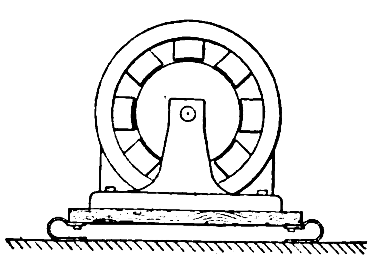

FIG. 2.

Civil Engineers, held in May, 1897, when Mr. James Swinburne read a short paper entitled "Should Generating Plant be Mounted on

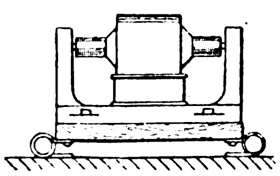

FIG. 3.

Springs?" Reference is made to a small dynamotor which was mounted on springs and placed on the top floor of a house; no particu-

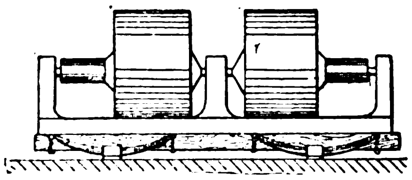

FIG. 4.

lars are given as to the method adopted, but the cure was an effectual one. Mr. Swinburne mooted the idea of mounting dynamos and

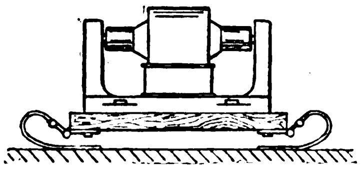

FIG. 5.

motors on springs in an article which appeared in "Industries" in 1892. Mr. W. Beaumont has done some good work in connection with

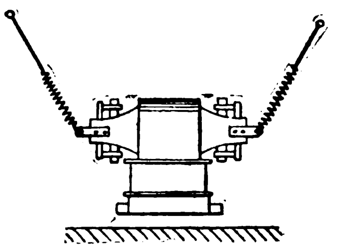

FIG. 6.

this subject, and has introduced his "vibromotor" principle, which is simple. "If a gear wants to wobble, let it wobble."

*From the "Electrical Review," London.

Preparing for the Advent of Automobiles.

Proprietors of cabs and cab drivers of Naples, Italy, are waking to the spirit of the times. They have formed themselves into an electromobile company for the purpose of transforming the hackney coaches and carrozolls into automobiles within three years, their desire being thus to forestall any foreign society that might introduce the new mode of locomotion.

MATERIALS USED IN THE CONSTRUCTION OF MARINE DYNAMOS AND THEIR ENGINES.*

BY ALTON D. ADAMS.

High efficiency, satisfactory operating qualities and reliability are prime requirements for marine dynamos and their engines. Next to these, the most essential characteristic of engines and dynamos for use on ships are small bulk and weight per unity of capacity. How pressing are these last-named requirements may be gathered from the fact that in merchant ships a considerable, and in war ships an even larger, percentage of the displacement beyond that of the hull is taken up by the necessary operating machinery.

Almost the entire construction and equipment of ships, except the electric plants, has been the subject of long study and careful experiment to determine the materials best suited for the purpose, and no reasonable expense has been spared in high-class war and merchant vessels to produce the best possible results. In the past it has been the most common practice on the part of both private shipbuilders and Governments, to accept what has been offered by dynamo and engine makers, so far as weight and bulk per unit of output are concerned. It is true that some restrictions have been put to the weights of electric generating sets, but these have only been such, in most cases, as good apparatus made for use on land could meet. The growing importance of electric equipment on ships and its applications to auxiliary power purposes seems certain to result in more exacting requirements as to weight and bulk.

Good design is able to meet the usual conditions as to efficiency, operating qualities, and reliability in dynamos and engines with the structural materials and shapes generally employed, but when bulk and weights are restricted, the kinds and shapes of the materials used are at once involved. The reason for this is found in the fact that structural materials for both engines and dynamos differ widely among themselves in their most important qualities. The characteristics of dynamo materials that have the most important influence on weight and bulk are those of magnetic and electric properties and mechanical strength. Most important of these properties is the magnetic, because of the wide variation among the available materials in this respect, and its large influence on the requirements as to mechanical strength and electrical factors. In the largest and heaviest parts of a dynamo the dimensions necessary to secure desirable magnetic qualities are much in excess of those required for mechanical strength, even where the best available materials are used. It is therefore highly important, where small weight and bulk are necessary, that the magnetic and electric parts of dynamos be of the most suitable materials.

To determine what materials are best suited for use in the several parts of dynamos, the purpose and action of each part should be considered. Taking up first the armature or receiving part, complete, it is found to consist of four essential elements—the shaft, core, windings and commutator. An armature shaft may be forged in one piece with that of its connected engine, but is more usually connected by coup lings. In either case there are no require-

*From "Marine Engineering."

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ments to be made as to its magnetic or electric properties, the main necessity being for mechanical strength and stiffness. To ensure the desired mechanical properties in a dynamo shaft of the least practicable weight its material and form should be minutely specified. Dynamo shafts should be forged of hard steel, having about 0.5 per cent. of carbon, and should be hollow, as hollow shafts are much lighter than solid ones for given length, dimensions, and strength. The largest and heaviest parts of an armature is its core, which in practically all cases is built up of wrought iron or very mild steel disks, either of which is suitable for the purposes of light weight when of the proper quality. Armature cores are especially designed to meet magnetic requirements, and their mechanical strength is commonly far beyond any possible demands upon it. Magnetic properties of their iron or steel disks, and the construction of armature cores as to ventilation materially affect their weights for given capacities, but it is hard to cover these facts save by specifications of the total armature or dynamo weight.

To hold the armature core together and enable it to be assembled independent of the shaft, the disks are mounted on a spider or sleeve, and this latter is adapted to slide on and off the shaft. This sleeve or spider usually has an extension beyond the armature core at one end, and on this extension the commutator is mounted. No electrical or magnetic properties are necessary in the spider, and its important qualities are sufficient strength and stiffness for its work. Cast iron is much used for armature spiders, because it is so readily obtained and easy to machine, but its low strength to resist twisting and shearing makes it unfit for the purpose where small weight per unit of output for the armature is desired.

The best material to use for armature sleeves and spiders for marine use is soft steel castings, such as can now be had from a large number of foundries. About the only objections to be urged against steel castings for the purpose just named are their somewhat higher first cost, both as to the price per pound and the labor for machining them. The additional cost per pound of steel castings is, however, about offset by their smaller weight.

A dynamo commutator consists broadly of two distinct parts, the shell or sleeve and the segments. The shell acts simply as a clamp to hold the segments together, and is usually made of cast iron. When the reduction of weight is an object, the commutator shell should be of steel castings, as these give the required strength and stiffness with the least weight. Pure forged or rolled copper is the only fit substance for commutator segments, in spite of claims to the contrary by any who wish to sell cheap segments or dynamos with poor commutators. Cast segments are hard to produce in chemically pure copper; their electrical conductivity is lower than that of the forged or rolled variety, and they do not resist the wear of the brushes as well. For equal results in operation the cast copper segments make a heavier commutator than forged or rolled stock and they should never be used on ship dynamos.

Poor ventilation or bad proportions may result in an armature core too heavy for its capacity, and such a core increases the necessary weight of copper wire for winding it. Copper in rods or wire is the only suitable material for armature windings, and those windings with joints at only the commutator end should be preferred to those having joints at both ends. Some armature cores have a large extension at one end to act as a support for the windings, but this is unnecessary and should be avoided. The magnetic cores and poles of dynamos—that is, those parts on which the magnet coils are mounted—form large and very important portions of the machines.

Magnetic properties are chiefly considered in the size and proportions of magnet cores and poles, their mechanical strength usually being far beyond any possible requirements. So great are the differences between materials as to their magnetic properties, that the weight of magnet cores may vary as much as 300 or 400 per cent., according to the materials selected. Cast iron, wrought-iron, and steel castings, are the materials available for magnet cores and poles. The widely different results as to weight that follow the use of the these several metals for magnet cores arise from their different magnetic capacities per unit of sectional area. If the magnetic capacity of wrought iron is taken as unity per square inch, that of cast iron is about 0.4 and of steel castings from 0.8 to 1. In other words, if a wrought iron magnet core with a sectional area of 100 sq. in. will do the work for a certain case, a core of equal capacity of cast iron must have 250 sq. in., and a core of steel castings from 100 to 125 sq. in. in sectional area. The length of magnet cores is determined by the amount of wire and energy used in their coils. An increase in the area of cores increases also the wire necessary for their windings, and usually therefore the length of each core. For the case of cast iron compared with wrought iron, the cast metal being 2.5 times as large in section, and probably 1.5 times as long at least, is 2.5 by 1.5 equal to 3.75 times as great in bulk and nearly that in weight. Where steel castings are used for magnet cores the increase in weight over that for wrought iron, if any, is obviously small. Great as is the addition of weight by the use of cast iron for magnet cores, it is further augmented by the larger amount of wire necessary for windings. Cast iron was much used at one time for magnet cores, but now steel castings and wrought iron are generally used for the purpose, and should be specified in every case.

The magnet frame or part that serves to mount the magnet cores about an armature, being the largest and frequently the heaviest single part, should be carefully selected where the reduction of weight is an object. While cast iron magnet cores have been largely abandoned, the cast iron frame is still very common. The purpose of a magnet frame is twofold—to mount the magnet cores and fix them to the base, and also to furnish magnetic paths between the several cores. Owing to the attractions between the magnetic poles and their armature, the frame is subject to large mechanical strains, but its section at any point is determined in most cases by the magnetic requirements. In cases where the necessary magnetic capacity can be had with a very small frame section, an excess of mechanical strength and stiffness can be obtained by giving the frame a ribbed or flanged form. Where the weight per unit of output is not material, the use of cast iron for magnet frames may be permitted, but for marine dynamos all frames should be of steel castings, except for some simple shapes where wrought iron is available.

However carefully a dynamo may have been designed to reduce its weight, it has been the too general custom to give an iron foundry a large job on the common base for a dynamo and connected engine. The fact of course is that unnecessary weight in a base is just as objectionable as though it existed in the dynamo proper. A dynamo base is not usually required to have any magnetic properties, but must be stiff and strong. Steel castings are much the more suitable material for dynamo bases where small weight is desired, and should be used to the exclusion of cast iron for this purpose in marine work. The saving in weight by a steel casting instead of a cast iron base is often enough to compensate for the greater cost of the steel.

To rest with restrictions on the weight and materials or dynamos only for an electric plant on board ship is to leave the work of specification but one-half done, since the ordinary engine for use on land is even less satisfactory in the matter of weight than is the average dynamo. Vertical engines are the general type best suited for driving ship dynamos, because of the small floor space occupied, the ease of making direct connection to the dynamo, and the high speed of rotation at which they may be operated. In land engines, and to a large extent those for electric plants on ships, cast iron has long been the most prominent material. Crankshafts, even in some instances, have been built of much the same material—that is, gun iron, which is simply cast iron of a somewhat higher grade and with an increase of strength above the ordinary metal.

Crankshafts for dynamo engines should be forged of hard steel and hollow. In sizes too small to allow hollow forging, the shaft may be forged solid, and the interior parts subsequently machined out. Connecting rods should also be of hard steel, but instead of the regular tapered forms, rods should be machined into some of the shapes that give required strength with a minimum weight of metal. Hollow piston rods are to be preferred to solid ones in large sizes. Steel castings offer a material saving over cast iron for piston heads and cylinders in the matter of weight owing to the strength required in these parts. Cast iron engine frames have in many cases heretofore made up a great part of their weights as used for driving ship dynamos, and it is in this part of the construction that considerable improvement is possible. A number of vertical engines that have been much used for driving marine dynomos are of what is known as the enclosed type, with hollow cast iron frames that connect cylinders and bases. Such an engine is necessarily heavy per unit of capacity. Other engines have a cast iron frame between the cylinders and base at one side, and a solid steel rod or rods at the other side, but these engines must also be discarded as too heavy.

The nearest approach to a really suitable engine for ship dynamos found among present standard types is put out by several makers with four or more solid steel standards to connect the cylinders and the base. This last-named type of engine is capable of production in very low weights, when parts other than the standards are made of the most suitable materials. Some engines on the market, however, in imitation of the steel rod construction between the cylinders and base, have used standards of cast iron for the purpose. An engine with these cast iron standards is unnecessarily heavy, and is apt to be fatally weak in its frame. The most desirable construction

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for light weight in that part of the engine frame between cylinders and base consists of hollow steel standards.

Instead of cast iron, the bases of engines for ship dynamos should be of steel castings, because of the large reduction in weight for given strength and stiffness effected by the use of this metal. About the only parts of engines for electric plants on board ship that may rationally be of cast iron are the piston rings and perhaps linings for the cylinders. By suitable designs with wrought steel and steel castings in engines and wrought iron steel and steel castings in dynamos, the weights per unit of capacity may readily be reduced as much as 50 per cent. for engines and 25 per cent. for dynamos below those often found in ship electric plants.

THE COMMELIN AND VIAU CADMIUM ACCUMULATOR.

Translated for ELECTRICITY from "L'Electricien," Paris, France.

This form of electric accumulator is a special type of an oxide plate or grid, to form the positive electrodes, and a negative electrode on which cadmium is deposited.

The positive electrode is so constructed as to reduce its weight to a minimum and is made up of an ebonite frame containing a lead grid, to which is riveted a conducting lead frame. This form is filled in the usual manner and afterward the active material is reduced to spongy lead peroxide, which, as a whole, makes a very light weight electrode, presenting great resistance to disintegration, especially to rapid discharges to which accumulators used for traction purposes are subject.

The negative electrode is made up of a sheet of insulating material, generally celluloid, which is completely enveloped by a sheet of lead 0.25 millimeters thick, folded on itself. Upon the two sides of the plate thus constructed are small troughs arranged in an oblique direction to the sides of the plate made up of a series of small celluloid rings forming side lines placed in rows, the distance between the rings being about 8 millimeters.

These creases are designed to facilitate the disengagement of gas bubbles and as well to hold the small particles of cadmium deposit which become detached from the plate.

The lateral and lower edges of the lead plate are covered with a coating of varnish to prevent the formation of arborescent depositions which tend to grow from the sides and bottom. The negative plates thus treated are electrolytically covered by a very fine granular deposit of metallic cadmium derived from a bath solution of cadmium sulphate.

Experiments have also been made with a cadmium deposition on carbon plates which have also given good results.

During the discharge the positive electrode acts as in ordinary lead batteries, that is to say, the peroxide of lead is reduced, while on the negative plate the cadmium is dissolved and transformed into sulphate of cadmium, which is taken up by the electrolyte solution. During the next charge the positive plate is peroxidized and the cadmium deposit obtained on the negative plate by the electrolytic disassociation of the sulphate of cadmium in the electrolytic solution. Experiment has proven that the cadmium deposit is absolutely insoluble in an open circuit.

The elements of the battery are separated by a sheet of celluloid placed between and against the positive electrode and resting on the projecting edges of the negative plate. The charged element has an electromotive force of 2.30 volts.

Following are some figures obtained from an experimental battery, which had an output of 80 ampere hours after receiving a charge of 100 ampere hours. The discharge from this battery had been allowed to continue until the difference of potential had fallen to 1.2 volts. The weight of the positive electrode in this battery was 500 grams and the two negative 300 grams.

ELEMENT OF 80 AMPERE HOURS.

Positive Plates.

Number of plates	5
Dimensions in cm.:	
Height	21
Length	10.5
Thickness	0.5
Weight of ebonite frame	22 grams.
Weight of lead conductor	100 "
Weight of active material	308 "
Total	430 "

Negative Plates.

Number of plates	5
Dimensions in cm.:	
Height	22
Length	10.5
Thickness with deposit	0.25
" without "	0.15
Weight of sheet lead 2.5 mm.	
Weight with its support	170 grams.
Weight perforated celluloid	15 "
" parchment paper	2 "
" cadmium deposited	52 "
Total	239 "
Weight of plate separator	12 "

Electrolyte.

Volume	1550 sq. cm.
Approximate weight	1800 grams.

Approximate weight of complete battery:	
5 positive plates	2150 grams.
5 negative plates	1195 "
Electrolyte, about	1800 "
Jar and connections, about	500 "
Total	5645 "

DISCHARGE CURVES.

It is interesting to note that the soluble electrode type of element behaves like a common battery and that there is no fear of sulphuration as in the ordinary all-lead accumulators, due to excessive discharge where the reduced lead from the negative side toward the end of the discharge has a tendency to be transformed into a sulphate and where the positive in its turn can be sulphurated if the discharge is allowed to continue; in the lead cadmium element the sulphuric acid liberated can always form a combination with the metallic deposit, which has been formed upon the negative plate during charging, for the resulting salt is soluble in the electrolyte. The sulphuration of the positive plate is then kept down by the dissolution of the negative plate, which absorbs all the free sulphuric acid, and consequently the discharge of the battery can be continued as long as desired, even up to the complete breaking up of the negative plate without any harm resulting to the positive plates, and further the difference of potential decreases very gradually and does not fall abruptly as in the all-lead battery where the two electrodes are reconverted from insoluble lead sulphate. This particular property of soluble electrode accumulator becomes of interest in automobile work, for it would prevent complete stoppages in driving the vehicle at a very slow pace even though the battery be almost completely exhausted and unable to furnish its usual service. Without contradiction this is one of the greatest inconveniences of electric driven automobiles and which can in this way be prevented, at the same time the lowering of the voltage, which results from the exhaustion of the positive plate, constitutes, as we may say, an automatic indication of the battery exhaustion to notify the driver to seek a charging station.

However, from the production standpoint, it has not been considered desirable to prolong the discharge to as low a voltage as 1.2 except to reserve this possible fall for extreme cases, without considering such a drop the normal working condition of the battery or as available for commercial practice.

The lead cadmium battery is a topic for further study, as it is not to be expected that the results derived from an imperfect element tested under laboratory conditions would be as desirable as practical work; but we may rightly consider from a theoretical point of view that the battery cannot be admitted to be inferior to the all-lead type, because the same identical chemical action takes place at the positive plate and the negative plates show almost 100 per cent. efficiency, but this class of battery should undergo a practical application in order to suggest these modifications so desirable to produce perfection, which will undoubtedly advantageously fit it for automobile practice.

PARIS LETTER.

Special Correspondence of ELECTRICITY.

Electric Traction in Paris.

The principal electric tramway lines have been in operation in Paris for over three months. At present there are three systems in use—the underground trolley and the contact systems of Vedovelli and Dialto. The last mentioned system has secured a franchise for not less than eighty kilometers of track and almost all the terminal stations. This installation has been constructed very rapidly, too rapidly in fact, which has resulted in frequent interruptions to the service. There are even rumors in circles supposed to be well informed that the Thomson-Houston Company has bribed the contractors of the rival line, who have the concession for the Dialto system, in order to secure poor track construction, with the object in view of making the operation of their competitors' road unsatisfactory; this seems very strange to us, and we would much prefer to believe that the system itself is seriously defective, in fact, as this system contains but one style of contact-boxes with their iron contact pin operating through a tube to make a mercury connection; it operates quite well on a level track, but when these boxes are placed on an incline, and as before, installed perpendicularly to the track surface, with the consequent result that in such a position the contact pin does not rise and fall freely through its tube, causing many irregularities, defective car-service, stoppages, and accidents to horses and people.

If these boxes are to be successfully operated on inclines they must necessarily be placed in a horizontal position with a special construction to make the surface of the box level with the street; with this modification, the contact pins

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will rise and fall freely, because then they will operate in a perpendicular plane.

On the left bank of the Seine, at Paris, especially on the Boulevard Pasteur, the inclines are very steep, and a long line of cars were stopped through the defect of the system; these stoppages are very common at this particular place. There are also many complaints of accidents caused by the tramway line and cars, and not a day passes without injury to carriages and people; the companies are to blame for this in not taking sufficient time to drill their motormen. It was supposed that the old employes and car drivers could be taught in a week's time to fill these new places; obviously this is an impossibility, for on steam roads a year is supposed to be the shortest time to train an engine driver; to make a good motorman, to operate electric cars in a city street, should take at least three months.

The long-distance suburban electric roads of Paris are being built rapidly; the Société des Aciéries de Micheville has just ordered from the Thomson-Houston Company three motors of 80 hp. each.

The work on the road from the Champ de Mars to Versailles, which will be electric and operated by the Compagnie de l'Ouest, is also being rapidly constructed and the part allotted to the Thomson-Houston Company will be completed soon. The Champ de Mars sub-station is finished, while those at Mendon and Viroflay will be completed soon.

We may say that all the suburban tramway lines are finished, and that the majority are in active service, and all of them are operated by the overhead trolley system; they meet the lines of the Dialto system at the fortifications where the cars change from overhead to surface contact.

Electric Lighting in Paris.

The Paris "Official Journal" has just published a long statistical municipal report, and it may be of interest to review some of its figures relating to the actual condition of electric lighting in the Parisian capital.

The number of gas lamps still in use for street and boulevard lighting is upwards of 50,516, to which must be added 55,420 magnesia lamps of high illuminating power.

For the public buildings in the city 58,104 gas jets are required, of which the schools take 35,128, the police and fire departments, the barracks and guards 5,572, and the Mayor's office and public libraries 113; as to electric lighting 983 arc lamps are required for 45 streets, 17 parks and squares, but does not comprise the Monceau and the Buttes Chaumont Parks.

The number of arc and incandescent lamps for lighting municipal buildings is more than 20,000, including the slaughter houses de la Villette, College Chaptal, Hotel de Ville and the Halles Centrales and Mayors' office in the Tenth ward, while during the year 1898 there were only 580 arc lamps and 12,022 incandescent used for the same purpose, showing a notable increase in two years.

The total amounts paid by the city of Paris for public lighting from 1826 to 1833 was 8,400,088 francs; 1834 to 1846 was 13,330,000 francs; 1847 to 1859 was 19,700,000 francs; 1860 to 1872 was 38,600,000 francs; 1873 to 1885 was 50,600,000 francs; 1886 to 1898 was 72,000,000 francs.

The quality and intensity of the street lights have also materially improved, for in 1889 the total illumination was 75,360 carcels while in 1899 it had grown to 146,117 carcels.

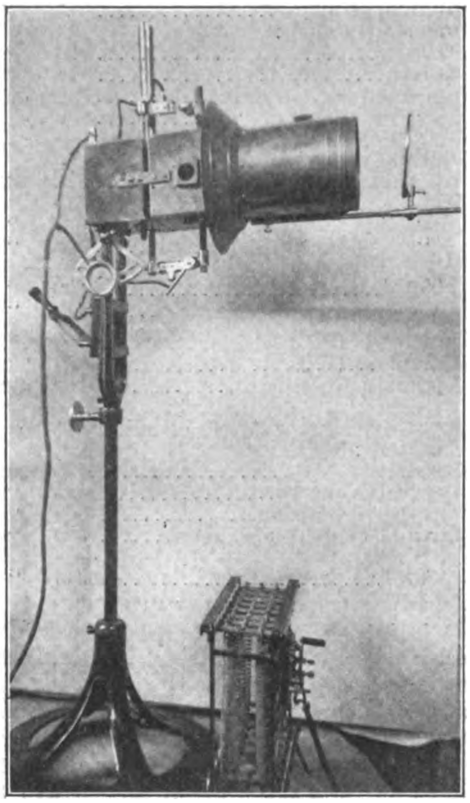
THE BLEYER ELECTRO-ARC CHROMOLUMES FOR GENERATING COLORED LIGHT RAYS.

BY J. MOUNT BLEYER, M.D., F. R. A. M. S., LL.D., New York City.

Since my experiments and discovery in 1894, that light has the power of traversing through the chest wall and other tissues of the body, both in health and disease, and its adoption by me for the treatment of tuberculosis of the lungs—I find that others have followed in my beaten track, and now make claims to it as original research. I beg to say at this opportune moment that my experimental work antedates them.

In 1896 I published in the "New York Medical Journal" some important forerunning remarks upon my undertakings in that line, and, as I say, gave out several hints, and since then have made many important chemical and physiological tests as to their powers in therapeutics.

Tuberculosis interested me most, so I dropped



Electro-arc Chromolume with Rheostat.

from my list of research many experiments which belong more properly to other domains of medicine, and I now leave to others the fulfillment of its many promises.

Prof. Finsen of Copenhagen may be ranked among the foremost of those who have successfully demonstrated facts which go far to prove the value of these rays. His institute for the treatment of skin tuberculosis by means of chemical rays of light has already gained an international reputation for itself.

A paper of special value has been read and published before the American Congress on Tuberculosis, February 22, 1900, and in "The Sanitarium," April, 1900, which dealt with many scientific facts. Therefore, I refer those who desire a more detailed account to the "Transactions" of that society and its other publications.

My specially constructed electro-arc light lamps for generating violet rays of light (color light or chemical rays), have undergone many changes since my early experiments. I found that concentration of light meant a great factor, and, therefore, more generating power was a necessity. This gave the parallel rays a much more penetrating capacity for dense tissues. I therefore reconstructed my older types, and now use the apparatus as illustrated.

Next came the question of simplicity of construction and management. I have succeeded in this undertaking after many trials. These illustrations show several types in use by me, in my daily chemical practice, which proved most satisfactory as to results. The types of lamps are capable of generating rays of the highest quality, besides the power of generation.

This test of penetration was first made by me several years ago. I now find that some one else makes a new claim to this—in other words, a re-discovery.

I showed that concentrated rays of light, as produced from an electric-arc lamp of high power, pass through the solid tissues as well as through bone by allowing these rays to fall directly upon the chest wall—and printing, as a proof of this fact, from a negative plate or film upon a sensitive plate—any subject matter thereon in less than fifteen minutes. This test, I say, has again been confirmed by Dr. J. W. Kime of Fort Dodge, and he differs in the method employed by using sunlight concentrated instead of the electric arc.

In sixty cases of tuberculosis of the lungs, I have employed these colored rays of light as an adjunct to the general treatment, with most successful issue. I find that electro-arc solarization can claim to rank as one of the greatest tonics. There are many scientific facts, regarding the chemical and physiological action upon the system, which need study, many facts which I have already studied seem to fill long-felt wants in the treatment of this disease. Of these sixty cases, I can report forty as cured, and in twenty, the disease has been arrested to such an extent as the pathological changes present admitted when they came under treatment. From my experience, I now fully believe that as an adjunct light rays in tuberculosis play a leading role. I want to stand upon these remarks for a future record. The administration of these rays must be understood from the very first, that dosage, and how given, plays an important part, and no one should attempt to use them homœpathically in any manner. Long exposure is one of the prime rules—nothing short of a half hour over the nude surface, a longer time is preferable for each sitting, over the selected area.

A simple description of these electro-arc generators of the chrom-rays and the method of employing them is essential. These lamps assume the name I gave them, "Electro-arc Chromolumes," as they are the sole producers of these specific colored rays. Their construction is so simple that their management does not require any study. They are all capable of giving from 5,000 to 25,000 candle power. This high candle power or efficiency is dependent upon the amount of current at one's disposal. High candle power is a necessity for curative purposes. There is no difficulty in getting any amount of electric current for their operation. All that is necessary is to have the room wired with an exact thickness of carrying efficiency, and then a transformer of exact size—which

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any company is ready to furnish on application. My own plant is furnished with an 80 ampere current transformer—and the lamps are so constructed that either more or less current does not affect them. By this arrangement any one can change his installation according to his intended work.

Each lamp for generating these chemical rays has fitted to it one rheostat, therefore more than one generating lamp can be set in operation in the same room or elsewhere at the same time; also they can be so installed to operate on one single rheostat for special selection of any lamp desired, if more than one is in use.

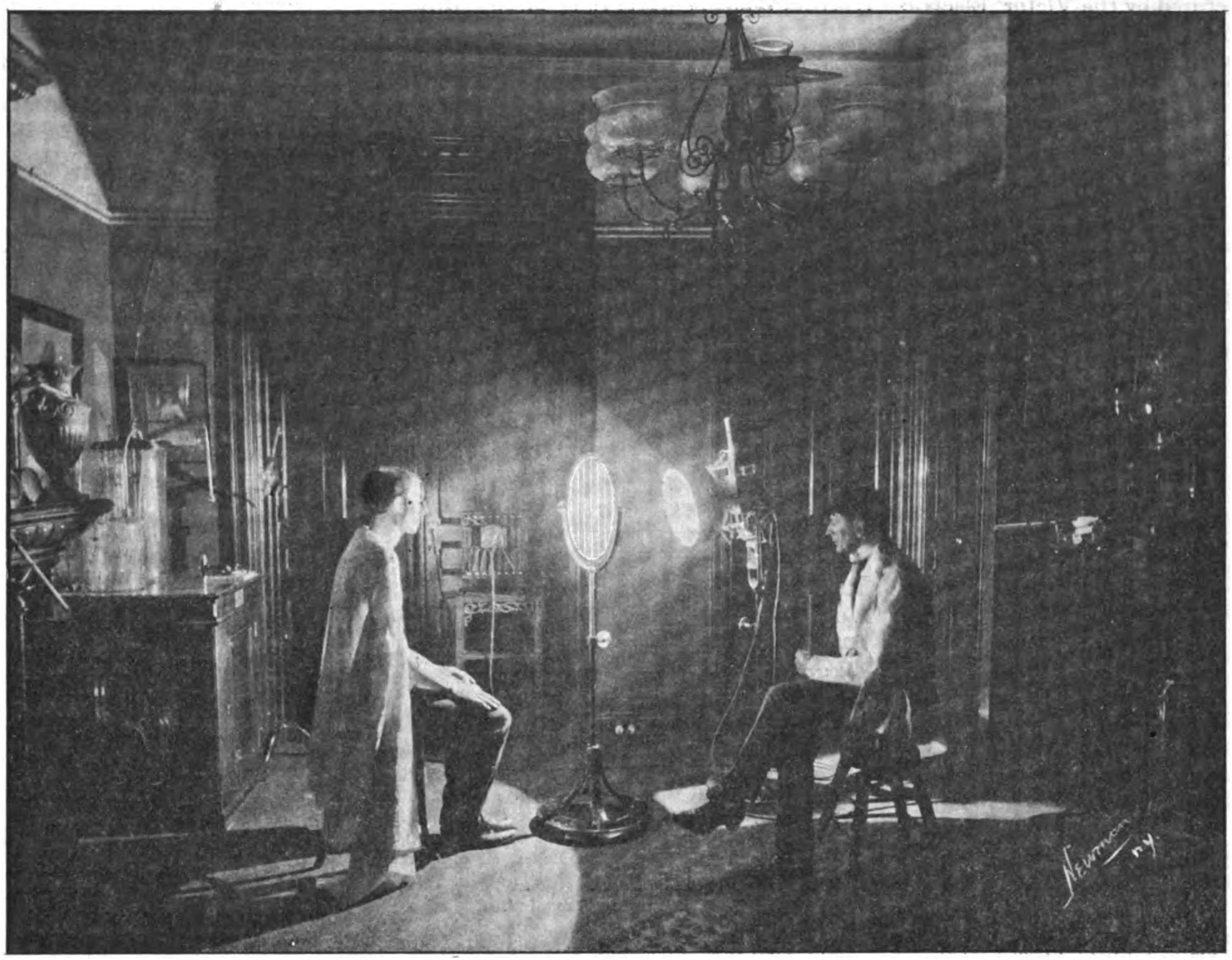
There are several different types of my lamps now on the market, which are made suitable for the different electric currents—for the high

ple of the searchlight, and has the same advantages as the other lamps.

A screen accompanies every Electro-arc Chromolume. This additional piece of apparatus is for the purpose of screening the heat rays emitted during the operation of the lamp upon a selected surface with a high concentration of the light beam for any length of time. It consists of blue glass, cut in strips, set in a framework, on a movable stand capable of many changes of position.

All these generating lamps are mounted on stands which give any angle of motion suitable for application. The entire lamp, screen, etc., can be moved over any area of the operating chamber. They have long cables attached to the lamps coming from the electric feeder of the installation.

such suitable remedies as are indicated according to the case in hand, 75 per cent. of tuberculous patients are curable, that is, curable to that extent according to the lesion or pathological changes already present at the time they come under treatment. Of course we all understand that pathological conditions, which have in certain stages of this disease left their markings, cannot be changed. We cannot give the patient any more breathing capacity after certain conditions become, so to say, stationary. Each case, however, should be taken on its own merits and treated accordingly, and only such promises can be made as accord with the state of the case. There are, however, forms of tuberculosis which can be thoroughly cured. Moreover, a large majority or percentage of these cases, should they pre-



SPREAD-LIGHT ELECTRO-ARC CHROMOLUME IN FULL OPERATION IN DR. J. MOUNT BLEYER'S LABORATORY FOR THE TREATMENT OF TUBERCULOSIS.

tension and the low tension, or the Edison direct or alternating current, and this was a most necessary point to be considered. For the high tension current I constructed a lamp which operates both automatically and as a hand-feed. This lamp, in order to get a steady and pure light spot, is provided with a set of plano convex, short-focus lenses, a moving gear for adjusting the focal lines—this adjustment being a most important device, as the focal parallel lines can be changed to the exact spot wanted. The focal spot ranges from a half inch to thirty inches of concentration. By this means any part of the apex or other portion of the anatomy can be treated accordingly. For the low tension (Edison direct current) the lamps are different; no lenses are used. The focal lines are created by a Mangin mirror, on the princi-

I have in use several of these types, and each one has its own particular value.

I present herewith an illustration of the Chromolume in full operation, taken from my earliest experimental work in 1894. This gives an idea how the light is applied to tuberculosis patients.

In concluding this article on my Chromolumes, let me say to those who will follow up this method of photo-therapeutics as an adjunct to the general treatment, that they will be most amply repaid for the trial. I wish to say it now, and what I say I am willing to stand by, that in certain picked cases of tuberculosis, there is no remedy equal to light as produced by the electro-arc, or direct solarization by the sun where it can be had. With light, hygienic food, fresh air, exercise and

sent themselves at an early stage, are curable by this adjunct treatment within from two to three months.

One important factor must always be borne in mind in the use of this method; namely, that a sufficient amount of time should be alloted to each case, not less than an hourly sitting daily.

This photo-therapy is most admirably adaptable for sanitarium and hospital purposes.

For years I have adopted a system for generating these colored rays of light. I have also shown where they are practical by the construction of solariums—these of course being more suitable to country than to city use, and also in a climate where the sunlight is in abundance.

The solariums must be constructed on

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plans which provide for all contingent and important necessities—heating, ventilating, cooling, glassing with colored glass intermingled with white glass, proper exposure, etc., are some of the principles embodied in their successful employment. Exposure of the patient also plays an important part in the treatment. The entire body in a nude state should be exposed to this light for at least two hours or more daily.

In our entire category of remedies, I know of none that can touch the tonic effects that the application of this method will produce.

These Chromolumes are made for me by the Universal Stage Lighting Company, 842 Broadway, New York.

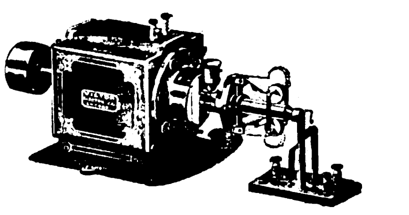
The Victor Igniter.

During the past two years the Victor $\frac{1}{8}$ hp. dynamo, manufactured by the Victor Electric Company, 420 Dearborn street, Chicago, has conclusively proven its superiority as a spark producer, having never failed where it has been given a fair trial, and there are at the present time over 500 of them in use on engines of almost every type and make.

Even a casual examination of the machine will disclose the causes of this success. It is built of good material; the bearings are long, the shaft is seven-sixteenths inch in diameter, the armature wire is imbedded in slots in a laminated toothed core, and is connected into a large 18 section standard lock nut commutator, all of which insures efficiency and durability.

The entire machine is metal clad with the exception of the brush opening.

The governor shown in cut automatically opens and closes the battery switch; a glance



THE VICTOR IGNITER.

at the cut will show the operation of this device, as the dynamo gets up to speed the governor forces out the operating sleeve, this sleeve in turn forces the middle contact spring backward, thus breaking one circuit and closing another, stopping the dynamo allows this contact spring to return to its normal position.

Where a few primary cells are used to start the engine, this switch automatically cuts in the batteries when the engine shuts down so that they are all ready to start with, and as soon as the engine gets up to speed the batteries are cut out, the dynamo then furnishing the spark.

Where small storage cells are used to start with the dynamo charges the cells at the same time that it is sparking the engine, and when the engine shuts down the dynamo is cut out and the batteries cut in ready to start.

All the switching is done automatically, no hand switches whatever being required.

The use of this device reduces the cost and care of batteries to the minimum; 4 cells of dry battery that can be purchased at 25 cents each will last at least a year as they are only used a few minutes each day. There is no danger of batteries being "run down" for the automatic switch is never careless and invariably opens the battery circuit as soon as engine is up to speed. Every Victor igniter is guaranteed for one year.

You Can With a Can.

It is a surprise to many to know that Dixon's Pure Flake Graphite can be used in an ordinary squirt can. It is nevertheless a fact, and a more convenient and efficient way for applying this wonderful lubricant cannot be found. Where the coarser flake is used the opening in the nozzle of the can may require enlarging. Only a dry can should be used. A can that has had oil in it will clog the graphite. Use a dry and new can. It will pay you to try graphite in this way.

PERSONAL MENTION.

Mr. George Chapman of this city was recently elected a director in the Electric Vehicle Company to represent John Jacob Astor's interest, as the latter is going South.

Mr. Charles E. Yerkes, son of Charles T. Yerkes, was lately elected president of the Lake Street Elevated Railroad in Chicago, to succeed Howard Abel.

INCORPORATIONS.

The Little Miami Traction Company, Xenia, O.—to construct and operate an electric road. Capital stock, $50,000. Incorporators: C. Christie, of New Cincinnati; J. P. Marion, W. D. Biddle, of Cincinnati; C. Orr, R. P. Ranney, R. L. Andrews, all of Cleveland, O.

The Arctic Construction Company, Seattle, Wash.—to construct tramways, railways, telephone lines, etc. Capital stock, $50,000. Incorporators: H. S. Peterson, W. L. Green, both of Skagway, Alaska, and A. B. Mitler of Seattle.

The Boise Fayette River Electric Power Company, Boise City, Idaho—to do a general railway and electric light business. Capital stock, $1,000,000. Incorporators: J. Spafford, H. E. Neal, J. C. Stout, E. Yanish and W. O. Stout, all of Boise City.

The Hamburg Electric Land Company, Buffalo, N. Y. Capital stock, $7,770. Directors- Lewis J. Heintz and A. J. Ross, of Buffalo, and Lorasso Fields, Rochester.

The Chambersburg and Gettysburg Electric Railway Company, Gettysburg, Pa. Capital stock, $50,000.

The New York Electric Supply Company, Carteret, N. J. —to operate electrical plants, Capital stock, $50,000. Incorporators: H. M. Suermont of Brooklyn, J. T. Brown and F. B. Hoffman, both of New York.

The American Steel Railway Generating & Power Company, East Orange, N. J.—to carry on the business of electricians, mechanical engineers, manufacturers, workers and dealers in electricity, motive power, heat and light. Capital stock, $2,500,000. Incorporators: Edward G. Johnson, Franklin D. Palmer and Joseph F. Vron.

The Colorado Springs Electric Company, Colorado Springs, Col.—to construct and operate an electric line. Capital stock, $1,000,000. Incorporators: W. A. Otis, W. P. Bonbright, L. T. Curtis, H. Hine, K. R. Babbitt, C. E. Palmer, J. A. Hayes, J. F. Burns and R. J. Rolles, all of Colorado Springs.

The Indiana Electric Company, Dana, Ind. Capital stock, $18,500.

The Central Electric Company, Grand Rapids, Mich.—to do a general electrical contracting business. P. C. Miller and W. P. Freligh will be in active control.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED DECEMBER 4, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

662,921. Apparatus for Electric Traction. Henri Dolter, Paris, France. Filed July 6, 1899.

663,198. Clip or Support for Trolley-Wires. William H. Russell, Watertown, Mass. Filed March 20, 1900.

663,201. Car-Fender. De Witt C. Wallace, Cairo, Ill., assignor of one-half to John T. Rennie, same place. Filed April 30, 1900.

663,232. Switch-Box for Electric Railways. William Kingsland, London, Eng. Filed July 5, 1900.

663,360. Electrical Rail-Bond. William Pervenko, Kiew, Russia. Filed Dec. 30, 1899.

663,376. Electrical Railway Signaling System. Louis C. Werner, Louisville, Ky. Filed Nov. 3, 1899.

663,398. Electric Railway. Ernst Sussmann-Hellborn and Wilhelm Hornauer, Munich, Germany, Filed Oct. 11, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

662,931. Electric-Arc Lamp. Frederick A. Gilbert, Brookline, and Emil O. Lundin, Beachmont, Mass., assignors to the General Electric Company of New York. Filed July 22, 1898.

662,995. Electric-Arc Lamp. Ozro N. Wiswell, Lynn, Mass., assignor to the General Electric Company of New York. Filed May 4, 1899.

662,996. Electric-Arc Lamp. James J. Wood, Fort Wayne, Ind. Filed Dec. 4. 1899.

663,095. Incandescent Body for Electric Glow Lamps. Alexander Just, Vienna, Austria-Hungary. Filed Sept. 20, 1900.

663,346. Electric-Arc Lamp. Walter C. Johnson and Adolph Wunderlich, London, Eng. Filed Sept. 10, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

662,928. Space-Block for Armatures. Henry Geisenhoner, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 18, 1900.

662,979. Automatic Magnetic Circuit-Breaker. William M. Scott, Philadelphia, Pa., assignor to the Cutter Electrical & Manufacturing Company of New Jersey. Filed April 27, 1900.

662,987. Circuit-Protector. Alfred Stromberg, Chicago, Ill. Filed June 28, 1900.

662,992. Electric-Current Indicator. Henry M. Warren, Schenectady, N. Y. Filed Dec. 9, 1899.

663,039. Flush Switch Support. Charles G. Perkins, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, same place. Filed June 28, 1900.

663,207. Means for Starting or Stopping Electric Motors. James J. Wood, Fort Wayne, Ind. Filed July 11, 1899.

663,075. Space-Block for Armatures. Henry Geisenhoner, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 28, 1900.

663,388. Electric Igniter for Explosive Engines. Montague S. Napier, London, Eng., assignor of one half to Selwyn Francis Edge, same place. Filed Jan. 8, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

662,984. Telephone-Exchange System. Alfred Stromberg, Chicago, Ill. Filed Oct. 18, 1899.

662,985. Telephone-Transmitter. Alfred Stromberg, Chicago, Ill. Filed Feb. 24, 1900.

662,986. Telephone-Exchange System and Apparatus. Alfred Stromberg, Chicago, Ill. Filed June 6, 1900.

662,988. Telephone-Exchange System. Alfred Stromberg and William M. Davis, Chicago, Ill., assignors to the Stromberg-Carlson Telephone Manufacturing Company, same place. Filed June 28, 1900.

663,196. Telephone-Receiver. Charles H. North, Cleveland, O., assignor to the North Electric Company, same place. Filed Nov. 15, 1899.

663,216. Railway Telephone System. Elmer E. Carpenter, Worcester, Mass Filed May 25, 1900.

663,367. Switchboard for Telephonic or Telegraphic Purposes. Charles Shore, Bolton, and Charles Heap, Caldershaw Rochdale, England. Filed Oct. 7, 1896.

MISCELLANEOUS.

662,911. Electric Heater. John E. Brown, Philadelphia, Pa., assignor of one-third to John J. Shanfelter, same place. Filed Jan. 24, 1900,

662,913. Elevator. John Bush, London, Eng., assignor of one-half to Arthur David Jenkins, Borough, Eng. Filed April 11, 1900.

663,015. Electric Meter. Thomas A. Edison, Llewellyn Park, N. J. Filed March 17, 1899.

663,043. Return-Signal Device for Call-Boxes. Joseph S. Robinson and Henry M. Robinson, Chicago, Ill. Filed Feb. 12, 1900.

663,059. Automatic Electrical Apparatus for Indicating Leaks in Ships. Vladimir W. Zvorikin and Serge de Blumenthal, Moscow, Russia. Filed March 24, 1899.

663,082. Fire-Alarm Telegraph Apparatus William H. Kirnan, Bayonne, N. J., assignor to the Gamewell Fire Alarm Telegraph Company, New York City. Filed Oct. 4, 1899.

663,130 Electrical Apparatus for Controlling Signals or Other Circuits. Homer A. Parrish, Jackson, Mich., assignor to the Parrish Signal Company, same place. Filed Aug. 11, 1899.

663,193-663,194. Phonograph. Frederick Myers, New York City, assignor to the Stylophone Company, same place. Filed Aug. 1, 1900, Oct. 12, 1900.

663,233. Connection of Strikers to Motor-Vehicles for Mechanically Operating Electric Switches. William Kingsland, London, Eng. Filed July 10, 1900.

663,289. Dry Battery. Ernest Meyer, Paris, France. Filed Nov. 10, 1899.

663,304. Magnetic Separator. Frederick Theilengerdes, Memphis, Tenn., assignor of one-half to Walter Goodman, same place. Filed June 8, 1900.

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THE TELEPHONE WORLD.

Telephone Competition.

The Interstate Telephone & Telegraph Company, organized more than a year ago, to give long distance connections to independent local telephone companies in Pennsylvania, New Jersey and Delaware, held its annual meeting last week at its offices in Philadelphia. It is stated that the company now has lines in operation from Jersey City through Trenton, Norristown, Allentown, Mauch Chunk, Hazleton, Wilkes-Barre to Scranton, connecting over 10,000 telephones and 400 places. At the meeting it was decided to extend the lines west to Pittsburg and Ohio and north to Binghamton, N. Y. This will connect over 50,000 telephones, and the price of long distance service will thereby be considerably reduced. This company has purchased lines in the western part of Pennsylvania extending from Altoona to Johnstown, and is negotiating for the purchase of several long distance lines in New Jersey. The following officers were elected: C. W. Kline, president; J. P. Helfenstein, vice-president; Major Thomas Daugherty, treasurer; A. M. Worstall, secretary.

H. A. Douglass, manager of the Atlanta, Ga., Standard Telephone Company, is quoted as saying: "Some days ago there was an article published in the local papers on the consolidation of the Bell telephone interests, and intimating very strongly that the Standard Telephone Company was soon to be absorbed by the Cumberland or some other Bell company. This inference appears to have been believed by a number of our subscribers and others in Atlanta, and we wish to state positively that there is not the slightest truth in the statement in any particular. The management of the Standard Company has no intention, and never has had, of selling to the Bell. Statements and insinuations of this kind are made with the idea of creating dissatisfaction among our subscribers, and to check or stop, if possible, the steady and very satisfactory growth and advancement that we are making."

Manager J. F. Uhler, of the Chesapeake & Potomac Telephone Company, is now offering telephone service at Hagerstown, Md., at a greatly reduced price and a war with the Maryland Company seems to have started. Two classes of service are offered, one costing $24 and the other $33 a year. Either rate entitles the subscriber to a 'phone in his house and a 'phone in his business place. The rate for residences alone is $1 a month. The Maryland Company at present charges $18 a year for rental of 'phones in dwellings and $24 a year in business places. It is expected these prices will be still further cut. The Maryland Company has about five times as many subscribers in Hagerstown as the Chesapeake & Potomac Company.

Promoters are endeavoring to interest citizens of Mt. Clemens, Mich., in forming a company to establish a county telephone exchange similar to the one now successfully operated in Oakland County with headquarters at Pontiac. Members of the council have investigated the Pontiac plant with a view to getting information before granting a franchise in Mt. Clemens. Several prominent men of Macomb County are interested in the enterprise, and it is believed that a franchise will be granted at the meeting of the council. The promoters promise a fair rate and the company will be so formed that a consolidation cannot be made with other companies. The raising of rates by the Bell Company, immediately after its absorption of the New State Company was not realized by the patrons and it is thought that an independent county exchange will prove popular.

The Suburban Telephone Exchange, recently established at Wyoming, O., is now in operation. The new exchange has connections with Cincinnati and all the villages around that vicinity, especially in the Mill Creek Valley. Over 300 telephones have already been placed in the villages of St. Bernard, Elmwood Place, Carthage, Hartwell, Wyoming, Lockland and Reading.

The judiciary committee of the board of supervisors of San Francisco, Cal., lately reported in favor of accepting the option offered by the People's Mutual Telephone Company on its franchise, provided that no consideration be named. It is considered likely that the option will be accepted as soon as the city attorney renders his opinion. The new company is reported to have already secured 7,000 contracts for telephones, and a syndicate is ready to take all bonds as soon as issued.

For several months telephone subscribers at Stonington and Mystic, Conn., have complained of the poor service at night, owing to the wires of the local electric light company being strung on the telephone company's poles. The electric light current makes an annoying buzz which causes difficulty in conversation. It is stated that the telephone company has decided that the electric light wires must be removed. It was said at Stonington that the electric light people intend to make a change in the location of their wires, which, it is hoped, will obviate the present difficulty.

By a unanimous vote the governing committee of the Stock Exchange in this city adopted the plans for their new building as drawn by Supervising Architect George B. Post and previously submitted to the building committee. The work of erecting the structure will begin on or about May 1 next, when the present buildng will be razed, temporary quarters being taken at the Produce Exchange. The plans shown include the Broad street elevation. The building will be nine stories high on that street, and the general outlines will be after the Grecian style of architecture. The lower floor will be given over to telegraph, telephone and cable companies, messengers' rooms and the like.

Interests hostile to the Bell Telephone Company are organizing at Norfolk, Va., a local telephone company with a capital of $200,000, of which the interests referred to, it is declared, will take $100,000 if necessary. The purpose is also to operate long-distance lines between Norfolk, Washington, Richmond, Baltimore and other neighboring cities. R. Henry Jones, a Norfolk capitalist, is interested. The Norfolk "Dispatch" printed the full details of the proposed rival company, which recently increased its rate on local 'phones 100 per cent.

The Mutual Telephone Company of Erie, Pa., makes an announcement that its long-distance service, in connection with the Union Telephone & Telegraph Company, is now open so as to include Union City, Corry and Waterford, Pa. This will be of great benefit to the large number of subscribers, which the Mutual Company has in Erie, who do business with the people of the towns named above, and also for the residents of those places, who wish to communicate with users of Mutual 'phones in Erie. The Mutual line is being constantly extended in all directions, and is giving the public a most excellent service.

The telephone war in Morristown, Tenn., continues, and as a result citizens are enjoying the cheapest 'phone service in the history of the city. The Citizens' Telephone Cpmpany, composed of local capitalists, allows its subscribers the free use of its toll lines, while the East Tennessee or the Cumberland Telephone Company is giving residence service for 50 cents per month.

The Richmond, Va., and Peninsula telephone line is under construction and steady progress is being made. The work is already finished as far up as Lee Hall, some twenty miles from Newport News. This telephone line will follow the roads quite near to James River and will bring most of the plantations along the stream within talking distance of Richmond.

The Oxford County Telephone Company is setting poles for a line between Buckfield, East and West Sumner, and North and West Paris, Me. By this line connection can be made with the New England telephone line at West Paris and Buckfield. The line is about twenty-five miles in length, requiring 700 posts.

The Rome Home Telephone Company at Rome, N. Y., has filed in the office of the Secretary of State a certificate of extension of route from the boundary line between Oneida and Herkimer Counties, to the village of Herkimer, terminating in the exchange office of the Herkimer County Telephone Company in Herkimer, a distance of sixteen miles.

The Bell Telephone Company is to have a strong and forcible competition at Atlantic, Ia. The Musson Brothers of Des Moines are building a well-equipped telephone system at Atlantic, and by next spring they expect to have connections with every town in Cass County. They will be in shape to start business this week with 250 'phones.

The automatic telephone service at New Bedford, Mass., is working well and giving general satisfaction. In fact its popularity is growing daily and the promoters of the company are delighted with their apparent prosperity.

The New York & New Jersey Telephone Company is making quite an improvement at Northport, N. Y., by doing away with its many wires strung through the main streets, and placing them in cables of fifty wires each. When completed there will be but one coil, in place of a large number of single wires.

The new telephone line now being built through Black River Falls from Eau Claire to La Crosse, Wis., is being pushed along rapidly, and will be one of the finest lines in that part of the State. The poles through the city are put up 50 feet high, towering far above anything in the pole line.

The board of aldermen of Portland, Me., recently voted adversely on petitions of the Dirigo Telephone Company and the Eastern Telephone Company for right of way in that city. This action leaves the New England Telephone Company in control of the local field.

The Farmers & Merchants' Telephone Company of Warsaw, Coshocton County, O., lately filed a certificate of increase of capital stock from $5,000 to $15,000. The officers of the company are J. P. Darling, president, and S. C. Kirsner, secretary.

For two days last week the State of Vermont was shut off practically from the rest of the country. A snow-storm and high gale having blown down most all of the telegraph and telephone wires of the State.

The Hudson River Telephone Company has commenced an action against the city of Johnstown, N. Y., to secure a permanent injunction restraining the city from putting wires in a subway underground.

Work has been started on the erection of a telephone exchange at Bolton, Miss., which is on the line of the long-distance telephone, and is also being supplied with a local service.

A permit was recently issued to the Providence, R. I., Telephone Company for the erection of a new building on the corner of Broad and Corinth streets, which is to be used as a branch exchange.

The Harrison, O., council has granted a 20-year franchise to the Harrison Telephone & Exchange Company. The line will extend through Okeana, New London, Venice, New Baltimore, Miami, Elizabethtown and Cleves, O.

A telephone line is to be built from Durham, N. C., to Chapel Hill (the university of North Carolina) and work on it has begun, which is expected to be finished by the holidays.

The local telephone company at Fergus Falls, Minn., is putting in an underground conduit of twelve ducts. Two cables of 100 and 200 wires each will be put in.

The State Belt & Lehigh Telephone Companies will build a telephone line from Nazareth to Allentown, Pa. They will work in conjunction.

At the annual meeting of the stockholders of the Salem, S. D., Telephone Company, a 10 per cent. dividend was declared. The system was established last May.

The new telephone line between Cazenovia and Oneida by way of East Hamilton, N. Y., has been completed and is now in operation.

The local telephone exchange opened a short time ago at Red Lake Falls, Minn. The switchboard has 100 drops and they will all be used.

The Cumberland Telephone Company is asking for a franchise for the erection of a telephone system in Harriman, Tenn.

TELEPHONE INCORPORATIONS.

The Akron People's Telephone Company, Akron, O. Capital stock, $1,000.

The Saline County Telephone Company, Marshall, Mo. Capital stock, $25,000 to $35,000.

The Tyndall Telephone Company, Tyndall, S. D. Capital stock, $2,500. Incorporators: B. W. Burnett, J. D. Elliott, C. M. Stillwell and others.

The Bryan Telephone Company, Bryan, Tex.—to operate in Brazos, Burleson, Robertson, Madison and Leon Counties. Capital stock, $12,000. Incorporators: Spencer Ford, H. C. Robinson, F. E. Griseck, J. E. Butler and J. B. Mike.

The Sikeston Telephone Company, Sikeston, Mo.—to operate telephone lines. Capital stock, $12,000. Incorporators: G. M. Head, of Marianna; C. H. Sander, J. G. Stern, both of Forest City, Ark.; J. M. Chaney, R. M. Phillips, S. B. Hunter, all of Sikeston; J. B. Waker, of Benton.

The Huntingdon & Clearfield Telephone Company, Huntingdon, Pa.—to operate telephone lines. Capital stock, $1,000. Incorporators: C. M. Gage, of Huntingdon; B. F. Meyers, C. B. Stucker, both of Harrisburg; W. B. Barnard, of Philadelphia; W. H. Denlinger, of Patton.

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GENERAL ELECTRICAL NEWS.

Lighting.

Brighton, Ia.—Brighton has decided to hold an election to decide whether or not the town will put in an electric light plant.

Bryan, O.—The city council is considering a change in the mechanical outfit at the electric light plant. New boilers must be substituted for the ones now in use.

Crowley, La.—This city has purchased and will enlarge the electric light plant of H. Widmer.

Dillon, S. C.—This city contemplates the installation of an electric light plant. Address S. S. Rozier.

Fairview, Mass.—The citizens are discussing the advisability of having more electric lights on their streets.

Franklin, La.—This city will issue $20,000 of bonds for adding power to its electric light plant.

Frenchtown, Pa.—The citizens of this village are making an effort to have electric lights for the streets and buildings of the place.

Gretna, Neb.—This town is discussing the question of erecting an electric light plant.

Jackson Springs, N. C.—The Jackson Springs Company, of which W. B. Hicks is secretary, wants information and prices on waterwheels and a 200-light dynamo.

Jasper, Fla.—B. E. Lennard, C. W. Smith, W. H. Greene and M. F. Home will establish an electric light plant.

John Day, Ore.—An electric company has been formed for the purpose of lighting this place and Canyon City. The capital stock is $10,000.

Jonesboro, Ga.—This city contemplates the erection of an electric light plant.

Juneau, Wis.—The citizens are considering the proposition to put in a $15,000 electric light plant.

Kearney, Neb.—The Kearney electric lighting plant was wrecked by an explosion a short time ago.

Kingston, Ont.—The civic light committee will recommend the council to establish a municipal electric light plant at a cost of $50,000 rather than arbitrate, and probably not buy the present plant owned by the Kingston Company.

Laurens, S. C.—The Laurens Furniture Manufacturing Company will install an electric light plant.

Ligonier, Ind.—The electric light plant at Hawesville was destroyed by fire recently. The plant will be rebuilt.

Los Angeles, Cal.—An application has been made to the city council for a franchise for the People's Lighting Company. It is proposed to furnish both electricity and gas.

Mystic, Ia.—The question of electric lights is again being agitated by the citizens of this town.

O'Neill, Neb.—The citizens of this place are agitating the question of erecting an electric lighting plant.

Oshkosh, Wis.—The time is near at hand, when the franchise of the Oshkosh Electric Light & Power Company expires; meanwhile a committee will investigate the question of municipal lighting.

Raubsville, Pa.—This town will be lighted by electricity by January 1.

Roswell, N. M.—Pete Wehner of the El Paso, Tex., Gas & Electric Light Company has obtained a franchise to establish and operate an electric light plant here.

Skaneateles, N. Y.—This village has voted to raise $1,000 to maintain the electric light plant and will have a municipal board of management.

Sparta, Tenn.—The Gainesboro Telephone Company of this city will receive bids for constructing a plant to have a capacity of 2,000 candle power and 500 candle power incandescent lights.

Sumas City, Wash.—There is an endeavor here to form a stock company among the leading business men for the purpose of putting in an electric plant to light the town.

Tipton, Ind.—Plans are being arranged for the establishing of a modern electric light plant here to be owned by the city.

Toccoa, Ga.—The Toccoa Falls Light & Power Company has been organized with E. P. Simpson president. It will erect an electric light plant.

Walla Walla, Wash.—An electric light franchise was granted to T. J. Kirk and others for the purpose of supplying the city with electric lights.

Waterloo, Ill.—Bids will be received until December 18 for machinery appliances and material and for the construction of a municipal electric light plant here. Geo. W. Ziebold, mayor.

Williamsburg, Va.—Several Richmond capitalists are considering a plan for erecting an electric light plant here.

Zionsville, Ind.—Zionsville will early in the new year construct an electric light plant.

Street Railways.

Beaumont, Tex.—The erection of a power plant to supply an electric railway is contemplated. Address I. D. Polk.

Bridgeport, Conn.—The sale of the Akron and Cuyahoga Falls Electric Railroad of Ohio to A. Radel of this city was consummated a short time ago. Mr. Radel assumed control of the property December 1. Over $100,000 will be spent in improvements, including an extension of the line.

Brooklyn, N. Y.—The Ridgwood power house of the Brooklyn Rapid Transit Company was destroyed by fire last week, with a loss to the company of about $150,000.

Kutztown, Pa.—The assistant superintendent of the United States railway mail service has inspected the Allentown-Kutztown Electric Railway, with a view to abolishing the star route between this place and Allentown, and having the service performed by the electric railway.

Larchmont, N. Y.—The Larchmont Railway Company has decided to substitute electric cars for the horse line now in operation.

Lincoln, Ill.—H. S. Beckemeyer of Mt. Pulaski has served notice that he will ask the board of supervisors for a franchise to build and equip an electric car line on the highway leading from here to Mt. Pulaski.

Middletown, Conn.—The Middletown Street Railway Company will ask the General Assembly next January for an amendment to its charter so that it can extend its trolley line to Meriden

Muskegon, Mich.—The Muskegon Street Railway Company will next spring relay its entire system with new rails at an estimated expense of $75,000.

Nevada, Mo.—Nevada contemplates having a new electric street railway in the near future.

Palmer, Mass.—There is beginning to be some talk of an electric railroad connection between here and West Warren.

Perth Amboy, N. J.—The board of freeholders of Middlesex County, has granted a franchise to the Raritan Traction Company of this place, for a trolley road along the Middlesex, New Brunswick and Perth Amboy turnpike from Metuchen to Perth Amboy.

Philadelphia, Pa.—It was recently announced that the Hudson River Traction Company, now operating a trolley line between the Fort Lee ferry and Hackensack, N. J., intends to extend its line west to Paterson, and soon through to this city.

Toledo, O.—Another electric railway is projected to run between Adrian, Mich., and this city. It will be built by the Toledo, Adrian & Jackson Railway Company.

Toronto, Can.—The corporation of this city desires to have an electric railway system constructed to run to and from the new St. Lawrence Market, Toronto, for a distance of 100 miles east, west and north therefrom, said railway system to have six or more main lines with branches and a total mileage for the present of 500 miles. E. A. Macdonald, mayor.

Wheeling, W. Va.—The electric street railway of this city will shortly consolidate with a capital of $6,000,000.

Worcester, Mass.—The Hampshire & Worcester Street Railway Company has petitioned the Legislature for commission to act as a common carrier of freight, baggage and United States mail.

Manufacturing.

Chicago, Ill.—Lewis Cook, William O. Chick and J. Albert Cook have lately formed a company, known as the Cook & Chick Company of this city, which will manufacture and deal in plumbing, heating and electrical supplies. The capital stock of the concern is $27,000.

Springfield, Mass.—The Stanley Electric Company has received the contract, amounting to about $100,000, from the Queens County Electric Company of New York for four generators of 1,200 horse power each. This concern has lately completed a 40-foot switchboard and two large generators for the Lehigh Power Company of Eastern Pennsylvania, worth about $40,000. It is now working on a switchboard for Englewood, N. J.

Company Matters.

New York City.—The board of directors of the Electric Vehicle Company held an important meeting last week at which it was announced that the company had absorbed the Riker Motor Vehicle Company of Elizabethport, N. J., and that a number of changes had been made in the list of officers and directors of the Electric Vehicle Company. George H. Day, of Hartford, Conn., was elected president.

Niles, O.—It is said that the Niles Electric Company will remodel its plant and put in a new engine and several new dynamos.

St. Louis, Mo.—By a recent request Mr. Wiggins introduced in the city council a bill to authorize the Imperial Electric Light, Heat & Power Company to construct, operate and maintain a heating and hot-water plant within the city limits, the franchise to expire on April 15, 1940.

St. Charles, Ill.—The supply factory of the Crown Electric Company here was burned recently. The building, valued at $17,000, with valuable machinery and stock, is a total loss.

Power and Transmission.

Boulder, Col.—A number of Denver capitalists are interested in an electrical plant scheme on the north fork of the St. Vrain Creek.

Silver City, Idaho.—Progress is rapid on the Swan Falls power plant of the Trade Dollar Mining Company of Owyhee County, and it will be rushed on to completion without delay.

Automobiles.

Cleveland, O.—The People's Automobile Company of this city has changed its name to the People's Automobile Manufacturing Company and its purposes so as to authorize it to make such machines.

Clyde, O.—The Messrs. Becker are now experimenting with a large automobile and will soon have one completed.

New York City.—The National Association of Automobile Manufacturers was held last week in this city. John Brisben Walker, in speaking of the association, said: "The association is not a trust. It does not intend to control the trade, but is simply an organization of men interested in the trade." The officers elected were as follows: S. T. Davis, Jr., president; J. H. Flagler, first vice-president; J. Wesley Allison, second-vice-president; C. J. Field, third vice-president; D. S. Walker, treasurer, and E. P. Wells, secretary.—The "Evening Telegram" of this city uses a pink electric automobile to distribute its papers. It is equipped with electric lights and bells throughout. The machine weighs 3,000 pounds, and is made to carry a load of 1,000 pounds.

Richland, O.—The Beardsley & Hubbs Manufacturing Company has been formed here to manufacture automobiles on a capital of $100,000. V. S. Beardsley, E. L. Sanderson, G. G. Hubbs, C. E. McBride, B. W. Willett, all of Mansfield, O, are interested in the firm.

Springfield, Mass.—The Skene American Automobile Company has been organized for the purpose of manufacturing motors of all kinds with $500,000 capital stock. The officers are: President, R. H. B. Warburton; treasurer, F. W. Robinson, both of this city.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Dec 10						
United Traction	100	$5,000,000	$5,000,000	1¼ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Dec 10						
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Dec 10:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Dec 10						
a United Railways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—Dec 10						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan. 15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co.......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	[illegible]	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	[illegible]	6,400,000	4 % S., Jan.	112	113
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156	157
Brooklyn N. Y.—Dec 10:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	239	233
Brooklyn Rap. Transit Co., tr certif.	100	43,000,000	48,000,000	....	71⅝	7¼
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d* Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad......pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
g Brooklyn, B. & W. E. Railroad	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Dec 10.						
Buffalo & Niagara Falls Elec. Ry	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Dec 10						
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	90	91
Charleston, S C.—Dec 10						
Charleston City Ry. Co	50	100,000	100,000	8 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Dec 10						
Chicago City Ry. Co	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	255	260
Chicago & South Side R. T. RR	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000		9½	10
Metropolitan West Side Elev. Ry	100	15,000,000	7,000,000	Feb 28 1900.	8[illegible]	82[illegible]
Met. West Side El., pfd	100	15,000,000	9,000,000	....	84½	84¾
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	208	210
h North Chicago City RR	100	500,000	249,900	....	197	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99½	[illegible]
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	100¾	100½
Union Traction Ry.........com	....	1,250,000	624,900	35 %	13	13⅛
Union Traction Co...........pref	100	2,000,000	2,000,000	5 % S.	58	55
Cincinnati, Ohio.—Dec 10:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	--	--
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Dec 10:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	8[illegible]¼
Detroit, Mich.—Dec 10:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	--
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Dec 10:						
City Railway Co.............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co..............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway		1,100,000	1,100,000	....	114	115

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

[C]incinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Dec 10						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Dec 10						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Dec 10						
North Hudson Co. (N. J.) Ry. Co	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind—Dec 10.						
**Indianapolis Street Ry	...	5,000,000	5,000,000	....	27	29
Lancaster, Pa.—Dec 10						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Dec 10:						
Louisville Ry................com.	100	4,000,000	8,500,000	1¼ %., April.	82	88
Louisville Ry..................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Minneapolis, Minn.—Dec 10						
Twin City Rapid Transit........com.	100	17,000,000	15,010,000	....	63⅝	6[illegible]¼
Twin City Rapid Transit....7 % pfd.	...	8,000,000	1,712,200	1¾ %. Oct.	136	157
Montreal, Canada.—Dec 10						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	272¾	273
Toronto Street Ry. Co	100	6,000,000	6,000,000	1¾ % S., J. & J. †	105¼	109
Memphis Tenn.—Dec 10:						
Memphis Street Railway Co	100	500,000	500,000	....	25	--
New Haven, Conn.—Dec 10:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	--
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Dec 10						
Canal & Claiborne RR. Co	40	240,000	240,000	4 % S., July,	..	--
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22	24
New Orleans Traction Co new pfd.	100	....	......	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	--	--
Orleans Railroad	50	500,000	185,000	1½ %., June,	--	[illegible]
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Dec 10:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	[illegible]
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900	166½	16[illegible]¾
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	[illegible]5	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR.........guar.	100	800,000	800,000	....	1[illegible]8	201
k Sixth Avenue RR..........guar	100	2,000,000	2,000,000	....	[illegible]05	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	116½	116¾
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Dec 10:						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	....	59¾	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	24½	25½
United Elec. Co. of New Jersey	100	504,000	504,000	11¾ % A.	23	24
Pittsburg, Pa.—Dec 10:						
Allegheny Traction Co	50	500,000	500,000	....	7	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	[illegible]5⅜	5½
Consolidated Traction Co......pfd.	50	9,473,850	9,000,000	3 %, Nov.	[illegible]2½	63
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	78
q Citizens' Traction Co	50	8,000,000	‡3,000,000	6 % A.	72¼	72½
r Duquesne Traction Co	50	8,000,000	‡8,000,000	6 % A.	--	...
s Pittsburg Traction Co	50	2,500,000	1,900,000	3½ %, Nov.	½	--
Federal St. & Pleasant Valley Ry.	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co	50	8,000,000		2 %, Aug.	--	--
Pittsburg & Birmingham Trac. Ry.	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry	50	8,000,000		5 % A., June	..	..
United Traction Co..........com	50	17,000,000		J. & J.	5	15½
United Traction Co..........pref	50	8,000,000		J. & J.	50½	51

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Dec 10						
Union Street Railway Co	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass—Dec 10						
Northampton Street Ry	100	800,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Dec 10.						
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65
Paterson, N. J.—Dec 10:						
Paterson R. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Dec 10:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Dec 10						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co........ $12½ pd	50	30,000,000	29,930,450	....	36⅞	37
bElectric Traction Co	50	....	8,297,920	....		...
dCitizens' Passenger Ry	50	500,000	†192,500	$3 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	200	...
cPeople's Traction Co	50	10,000,000	†6,000,000	8 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖885,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry.	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Dec 10						
Rochester Railway Co	100	5,000,000	5,000,000	....	20	23
Reading, Pa.—Dec 10						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo. Dec 10						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,300,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry..........com.	50	500,000	500,000	....	19	20
United Electric Ry.......6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	63	65
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July, '99.	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Dec 10						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
mScranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
mScranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Dec 10						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Dec 10						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Dec 10:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Dec 10						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	‡108¾	109
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	272¼	273
Washington, D. C.—Dec 10:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.		...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Dec 10						
*Worcester Traction Co........com.	100	8,000,000	8,000,000	....	81¼	84
Worcester Traction Co.....6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Dec 10.						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS

NAME.	Par	Capital Stock. Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass. - Dec 10						
American Tel & Tel Co	100	50,000,000	28,660,000	1½ % Q., Jan.	158½	164
Erie Telegraph & Telephone Co	100	..	..	1 % Q., Feb 20,	108	[illegible]
New England Telephone Co	..	10,894,600	10,894,600	$1.50 p. sh. Feb	127½	128
New York.—Dec 10						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	170	175
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co. guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		3	3½
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	165	170
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	.
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co.	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	83	83¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous. - Dec 10:						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	.
Chesapeake & Potomac Telep. Co.	100	......	......	....	67	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.)	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	..	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	.... .	......	..	96½	97
Southern New Eng. Teleph. Co	100	3,000,000	......	..		..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 10						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898	.	.
General Electric Co. [new] "	100	18,276,000	18,276,000	1⅓ % Q., Apr., 1900	170⅞	171
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	..	22	28
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	...	53½	54
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	64	65
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,196,126	......	44¾	45
New York.—Dec 10						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.		..
Edison Ore Milling Co	100	......	......	...	8	12
Electric Vehicle Co..........com.	..	......	......	...	..	..
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898		..
General Electric Co. [new].... "	100	18,276,000	18,276,000	1⅓ % Q., Apr., 1900	170⅞	171
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000		41	.
‖Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Dec 10						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Dec 10						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	80	85
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	82	90
Northern Elec. Light & Power Co.	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	20	--
Miscellaneous. - Dec 10						
Bridgeport (Conn.) Elec. Lt. Co.	25	300,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	175	176
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	.
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98½	99
Rhode Island Elec. Protec. Co	100	.....	......	....	11¾	20¼
Royal Elec. Co. (Montreal)	..	1,000,000	.....	4% Q	‡206¼	208
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	133¾	134
Thomson-Houston Welding Co	100	......	.....	3 % S, Dec. 1,	.	100
Woonsocket (R. I.) Electric Co	100	. ....	.....		105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authorz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass. - Dec 10:						
American Electric Heating Co	50	10,000,000	....	...	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p. sh.	--	100
New York.—Dec 10:						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co..........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Dec 10						
Electro Pneumatic Trans. Co	10	1,500,000	......	--	3	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	--	..	162
Welsbach Commercial Co.....com.	100	3,500,000	......	--	[illegible]	[illegible]
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	43½
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Dec 10:						
Carborundum Mfg. Co	100	200,000	200,000	....		..
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	209	210
Miscellaneous.—Dec 10						
*Barney & Smith Car Co.......com.	100	......	1,000,000	--	13	16
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	94	96
Billings & Spencer Co	25	......	....	....	32	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co	100	....	....	--	105	109
*Pratt & Whitney Co..........com.	100	......	....	--	2	4
*Pratt & Whitney Co..........pfd	100	....	......	--	40	50
Stillwell-Bierce Co..........com.	--	....	....	--	.	50
Stillwell-Bierce Co..........pfd.	--	....	....	2 % Sept 1,'99.	50	65
Shultz Belting Co	100	500,000	....	....	80	90
St. Charles Car Co	--	....	....	......	89	106

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Dec 10, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117⅛	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co..................1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co...... 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR..........1st mtg. 5s.	500,000	47,000	1906	J. & J.	...	....
†Charleston City Ry.............1st mtg. 6s.	350,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¾
†Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T............ 4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry......1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108⅛	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96⅛
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.		......
North Chicago City Ry......consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114⅛	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103⅛	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry..........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121⅛	122⅛
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114½
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105⅛	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Dec 10 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,335,000	1905	A. & O.	......	102⅛
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	
The Detroit Ry..................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Dec 10 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winhester Avenue RR......Deben. g. 5	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.. cons mtg. 6s.	$150,000	$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105⅛	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1908	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	......	...—
‡St. Charles St. RR. Co.......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave..........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105⅛
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	109⅛	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98⅛	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1908	J. & J.	101	108
§D Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co......Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	...
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116⅛	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry ....Deb. 5s.	300,000	300,000	1909	J. & J.	108⅛	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	850,000	850,000	1919	....	110⅛	112⅛
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128⅛
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry......1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	118	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Dec 10 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.........................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry..............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Dec 10, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry.......................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry...........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry....................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	...	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,300,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col tr. 4s.	29,735,000	29,724,876	1945	A. & O.	——	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg. Pa.

Date of Quotation—Dec 10 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co.................1st mtg. 5s.	875,000	875,000	1930	J. & J	.....	......
Citizens' Traction Co..............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	...	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	
Millvale, Etna & Sharpsburg...............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	.
Pittsburg & Birmingham.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	...	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co.....................5s.	2,500,000	2,039,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	W. & S.	......	....

Providence R. I.

Date of Quotation—Dec 90, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Dec 10, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101⅛	102¼
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101⅛	102⅛
Citizens' Railway Co.......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mar. Ter...1st	1 000 000	000 000	191	J & J	17	

*With interest, *Unlisted.

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation— Dec 10 , 1900.						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000 000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75,000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	3,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry................Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1913	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
San Francisco Cal.						
Date of Quotation— Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
†Park & Cliff House RR.........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Washington D C.						
Date of Quotation— Dec 10 1900						
Belt Ry. Co.........................C . . mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry..................................mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation— Dec 10. 1900.						
Bridgeport Traction Co...... 1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	3,000,000	2,366,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu s, O.)..1st mtg. g. 5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry. ......1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.).Cons. mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N. J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry..............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$900,000 in treasury. Bonds guar. by Buffalo Ry. Co.
¶$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
§$950,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'rest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass						
Date of Quotation- Dec 10 900						
Delaware Gas Lt. Co., ...1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	...
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation Dec 10, 1900						
Allegheny County Light Co....... ..... 6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Dec 10, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	......	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	...	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous						
Date of Quotation - Dec 10 1900.						
American Bell Telephone........ .... 4s.			1908	F. & A.	100½	101
Northwestern Telegraph Co................7s.	....	......	...	......	....	......
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	..	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous						
Date of Quotation—Dec 10, 1900.						
American Electric Heating .... 7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co.............	....	....			.....	25
Barney & Smith Car Co.........................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co..........................6s.		....	1904	J & D.	......	......
Worthington Pump Co......——.....	75,000	....	.....	——	115	127

Unlisted †Nominal

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The North Jersey Street Railway Company, which controls the street railway lines of Hudson County, N. J., has acquired the lines in Union County.

The Chicago Telephone Company has declared the regular quarterly dividend of 3 per cent., payable January 2. Books close December 26 and reopen January 3.

The Commercial Cable Company directors declared a regular quarterly dividend of 1¾ per cent. and a bonus of 1 per cent., payable January 2. Books close December 20 and reopen January 2.

The South Side Elevated Railway Company of Chicago has declared the regular quarterly dividend of ¾ per cent., payable December 31. Books close December 20 and reopen Janary 2.

It is reported in Minneapolis that a syndicate, composed of F. V. Green, A.W. Sewall, M. H. Elliott and others, is negotiating for the purchase of the Twin City Rapid Transit Company from Thomas Lowry.

The Brooklyn "Eagle" says there are strong financial interests in Manhattan willing to purchase control of Brooklyn Rapid Transit in the neighborhood of 50. It is understood strong efforts will be made during the next two or three weeks to force the price back to between 50 and 60.

An officer of the Chicago Union Traction Company is reported as saying: "November business was satisfactory, even though figures are not given out. Elevated competition has cut into our gains, but has not actually reached our profits. We will continue to pay a dividend as we have in the past."

The Syracuse Rapid Transit Railway Company reports for the quarter ended September 30, 1900: Gross earnings, $143,905, increased $21,271; net earnings, $63,413, increased $6,296; surplus after charges, $9,079, increased $2,321. The balance sheet shows cash on hand of $3,903 and a profit and loss surplus of $45,452.

Exports from the United States to Cuba, Porto Rico and the Philippine, Hawaiian and Samoan islands will aggregate more than $50,000,000 this year, against $41,000,000 in 1899, $19,000,000 in 1898 and $17,000,000 in 1897. This enormous growth is shared by each of the group of islands named, but is especially apparent in the case of Porto Rico.

The subscription to the 4 per cent. Third Avenue Railroad (New York) bonds which was opened last Friday morning at the office of Kuhn, Loeb & Co., was immediately closed, applications received being far in excess of the $10,000,000 bonds offered. The bankers state that bona fide investment subscriptions will alone be considered and that all speculative applications are to be declined.

The Electric Vehicle Company proposes to increase its capital stock by the issue of $1,000,000 preferred and $2,000,000 common, the proceeds to be used for payment of the shares of the Riker Motor Vehicle Company which has just been absorbed by the company. Robert A. Lloyd has resigned from the presidency of the Electric Vehicle Company and is succeeded by George H. Day, president of the Electric Storage Battery Company.

Lease of the properties of the Easton (Pa.) Consolidated Electric Company to the Lehigh Valley Traction Company was ratified at a special meeting of stockholders of the former company, held at their office in Camden Friday. The lease provides for the payment of an annual rental of $45,000, equivalent to 10 per cent. upon the amount paid in on the stock of the Easton Consolidated, which will be $15 a share after the final call has been made.

At a meeting in Boston on Monday the directors of the General Electric Company declared a dividend of 2 per cent., payable on January 15, 1901, to stock of record December 29, and an extra dividend of 1 per cent., payable on the same date. The extra dividend of 1 per cent. is to bring up the dividends to the 8 per cent. basis for the year. The previous dividends declared this year were 1½ per cent. for the quarter ending April, 1½ per cent. for that ending in July, and 2 per cent. for the October quarter.

The Boston "News Bureau" says: Great interest is manifested over the delay in probating the will of Marcus Daly, who, as president of the Amalgamated Copper Company, held at one time $15,000,000 of its total capital. It is declared in some quarters that the election of Mr. Scallon as president of the Anaconda, was necessitated by the Daly position in respect to Anaconda, and it is asked whether there may not be some Daly strings on the transfer of Anaconda stock to the Amalgamated, which are as potent to-day under Mr. Daly's will as when he was alive.

The following statement was made by a leading Philadelphia financier on Saturday: "The declaration of the Electric Storage dividend has given the stock a status it has never had before. Seeing the large earnings reported from year to year and no dividend paid had sort of made the public skeptical as to dividend prospects, but the present action has removed this. When it is found that the company can distribute out of its earnings $1,000,000 and more per annum, in the form of cash dividends to its stockholders, it is to be recognized that the Electric Storage Battery Company is an industrial proposition of considerable size, and that the talk of commercial success has not been all wind."

An interest in the $30,000,000 Telephone, Telegraph and Cable Company of America, says the negotiations are now going on for a combination of this company with other large telephone interests. He says that if the negotiations are consummated, he understands the Telephone, Telegraph & Cable Company stockholders will get a guarantee equal to 6 per cent of the amount paid in on the stock. It is said that if the combination is effected, the last assessment of $5 a share on the Telephone, Telegraph & Cable Company may be recalled, or in case the payments have been made, the amount of the call may be returned. Of the $30,000,000 capital only $13,765,000 has been issued, and $10 a share, or $2,753,000 has been paid in. The payment of current $5 call, or $1,376,500, will be used in extension of the business on the present lines, in case the arrangement now contemplated is carried out.

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ELECTRICITY.

VOL. XIX. NEW YORK, DECEMBER 19, 1900. NO. 24.

ELECTRICITY

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SINGLE COPIES, - - - - - -	10 cents

emit by Express, Money Order, Draft, Post Office Order or Registered Letter.

ADVERTISING RATES.

As ELECTRICITY reaches all classes interested in electrical work, its value as an advertising medium can be readily understood. Rates will be sent on application.

Changes of advertisements should reach the office not later than the Saturday preceding the day of publication.

Entered at the New York Post Office as second-class mail matter

THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

Christmas—the Last of the Century.

Before the next issue of ELECTRICITY reaches its readers, the last Christmas Day of this century will have come and gone. The day—always one of merriment and good cheer—should this year be looked upon as one of thanksgiving by the whole country in general, and by the electrical fraternity in particular. Since the Christmas of 1899, the country has passed through the throes of a National election, and is assured of another four years of the same administrative policy, which, from a business standpoint, is to be desired, as a change of administration, whether for the better or the worse, invariably tends to upset business through uncertainty and apprehension of radical changes.

The electrical industry has much to be thankful for. In this country the demand during 1900 for electrical machinery and apparatus has been exceptionally brisk, while the principal manufacturers in the electrical line are reaching out into foreign countries for new markets, with what success may be inferred by an examination of the growing list of weekly exports.

It is to be hoped that the present unusually prosperous conditions will continue to prevail during the coming year, and that our friends, advertisers and readers, to whom we wish a very "Merry Christmas" and "Happy New Year," will one and all feel its influence.

* * *

Pipe Galleries.

In a large city galleries in which water mains, gas pipes and electric light wires may be placed, are much to be desired. Paris has its subways in which the innumerable network of mains (which literally fill the streets of New York) are placed, while London has a few miles of pipe galleries, with the prospect of many more in the near future.

The question as to whether pipe galleries should be built in conjunction with the underground rapid transit road in this city, has been discussed pro and con, and although the extra expense of such galleries will undoubtedly be great the demand for them is apparent to any one familiar with the underground topography of the city as it exists at present. It is no exaggeration to say that the principal thoroughfares, especially in the lower part of New York City, are so filled with underground structures, such as telephone conduits, electric light conduits, gas mains, etc., that in years to come it is hard to see how any more can be laid to meet the increased demand that must necessarily arise. In view of this fact pipe galleries, somewhat similar to those made use of to a limited extent in London, become a necessity. In the English metropolis, as explained in the issue of November 30 of the London "Electrician," the pipe galleries contain two miles of gas mains, about the same length of water mains, and five to six miles of electric light cable. These subways are built mostly with their crowns a short distance below the surface of the roadway or sidewalk and with their floor above the sewer. As a rule they are about 7 feet wide by 12 feet high and have vaulted roofs. The walls are of brick. Stone floors have been adopted and these are drained by shallow channels cut in the stone and leading to gratings placed every eight yards or so. These gratings cover bell traps, through which there is communication with the sewer beneath. In this way the subway is kept clean and dry. Immediately above each of these galleries, is a narrow ventilating shaft, terminating in a grating on the sidewalk or roadway. To avoid splashing and to collect the mud and water which comes down, large pans on tripods are placed beneath these roadway gratings, and these pans are emptied once a week. The heavy mains usually rest on suitable blocks along the floor of the subway, or are placed, in some instances one above the other, on specially constructed brackets. The telephone and telegraph wires are located in troughs running along the wall.

When it is desired to supply a consumer with either water, gas or electricity, the services are taken off through cast iron "service shoes," which are built into the walls of the cellars.

These subways are as a rule lighted by gas, although electric light is made use of in one instance. Precautions to avoid explosions from gas escapes are taken on opening the subways every morning. For the first inspection safety lamps only are used and if a gas leak is detected, immediate steps are taken to have it remedied.

Our contemporary adds that in this connection it is worthy of note that so far there has been no trouble from gas escapes, or from the bursting or leakage of water mains, and that it is this question and the question of ease of making service connections, which will weigh

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most with the electrical engineer in deciding whether he shall favor the laying of electric light and power mains in subways in common with mains of other service, instead of in the street.

In a city such as New York the ideal subway system would be under the sidewalks, but this would mean the annexing of innumerable vaults throughout the business district, with the enormous expense which invariably accompanies such undertakings.

* * *

Another System for Purifying Sewage by Electricity. Another invention for purifying sewage by electricity has made its appearance, which is hailed by the daily papers as being something new and startling. The originator of this process is a resident of Newark, N. J., and in a recent issue of the Newark "Daily Advertiser" there appears a description of the apparatus and modus operandi of the process which is principally remarkable through its lack of technical accuracy and its indefiniteness. For instance, the article says:

"The sewage of a city can be turned into a receiving tank, where by screens the heavier parts are separated. The fluid then passes into a second tank which is filled with electrodes of manganese and dioxide with a little aluminum. These electrodes are set side by side, about three inches apart, and have openings in the side through which the sewage flows. When the tank is filled a force of about 110 volts of electricity is turned into the electrodes, and the process of devitalizing begins. All the impurities rise to the surface and form a thick scum. This separation of the noxious elements in the water is brought about, the inventor says, by the action of the electricity on the oxygen and hydrogen gases of which it is composed. The effect produced in the few minutes the current was turned on was certainly surprising. The water seemed to boil, first turning white as milk, and then a dingy brown. The scum formed quickly and soon assumed the consistency of putty. There is no sediment, all the impurities being driven to the surface. The water is then slowly drawn off and turned into the river, or can be stored in reservoirs for use in extinguishing fires or sprinkling the streets, thereby saving an enormous waste of clear spring water. The refuse is then removed from the tank and put into a 'digester,' from which it passes through a steam worm to a receiver, and becomes clear ammonia of much strength. This in turn is evaporated by steam, and becomes ammonium salts, which is worth to-day $56 a ton, with a limited supply. The coarser matter is converted in still a third receptacle into a fine odorless powder, which, it is claimed, is the finest fertilizer known. The inventor asserts that after the installation of a plant the works will pay for themselves, and an endless supply of hitherto wasted water will be at the disposal of the city using it. He has tested the apparatus with every known dye, with the same result. No noxious substance of any kind seems able to withstand the forces of disintegration produced by the electricity."

The New York "Herald," commenting on the subject, among other things says;

"If science has in this way mastered the purification of sewage, enabling cities to dispense with enormous and costly systems of sewers, there seems to be no reason why a similar process might not be employed to purify water. If organic impurities and disease microbes can be oxygenated by electricity, filtering plants and other methods of cleansing public water supplies will soon be back number contrivances."

As is well known the purification of sewage by electricity is by no means a new idea, Mr. Woolf having built a plant for this purpose at Brewsters, N. Y., as early as 1893. The Woolf process, which consisted in passing a current of about 700 amperes at a pressure of 5 volts between a platinum electrode and a zinc electrode immersed in salt water, which liquid was afterwards mixed with the sewage to be purified, has been tried at Danbury, Conn., at Riker's Island and other places. This electrical method of sterilizing sewage has proven fairly satisfactory, and unquestionably economical, but for several reasons it has not been extensively adopted. In the above item from the Newark "Advertiser," it is stated that the local inventor makes use of a current at a pressure of 110 volts, whereas in all the systems so far brought out, the voltage made use of—as in the case of the Woolf system—has been very low, usually not exceeding six volts. This statement, however, may simply be another one of the numerous errors in the item. The New York "Herald" wisely suggests that if sewage can be purified by a current of electricity, there is no reason why water could not be purified in a like manner. Possibly the writer meant this remark as a joke, for it is a well-known fact that electricity has indirectly been employed, to a limited extent, for purifying water for the past several years.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

General Greely, chief signal officer of the United States Army, has been informed that the signal corps telegraph lines in Porto Rico have been turned over to the control of the civil authorities of the island.

The first regular meeting of the Roentgen Society of the United States opened December 13 in the Grand Central Palace, New York. Besides the members in New York, about 200 delegates were present from other States. The meeting discussed the value of the X-ray as a therapeutic and pathological agent. In connection with the meeting was the most perfect exhibit yet placed before the public. It embraced static machinery of the most recent make, coils for generating and Crookes tubes of recent invention. Dr. Heber Robarts of St. Louis and Dr. J. Rudis-Jicinsky of Cedar Rapids were re-elected as president and secretary-treasurer, respectively. Other officers elected were: First vice-president, Dr. G. P. Girdwood of Montreal; second vice-president, Dr. Bender; assistant secretary, Dr. Price.

With a view to the establishment of a system of searchlights at the defensive works in New York harbor, the Chief of Engineers, Gen. Wilson, has submitted to Congress, through the Secretary of War, an estimate of the cost of such work, which he places at $150,000. The committee on appropriations will be asked to include this sum in the estimates for fortifications and other works of defense required for the use of the War Department for the service of the fiscal year ending June 30, 1902.

A stringent ordinance has been adopted in Oswego, N. Y., to prevent the careless stringing of electric wires which have caused great damage during the past year.

A dispatch from Manila states that the United States cattle ship Burnside this week will proceed to Damuguete, Island of Negros, to begin the laying of 600 miles of Government cable to connect Negros, Mindanao and Jolo. Negros and Cebu already have cable connection with Iloilo and Manila. The new line will extend from Damuguete to Oromaueta, Misamis, Iligata and Tagoloan, all on the north coast of Mindanao. A land line will connect Misamis and Tigum and the main portion of the cable will extend from Tigum to Zamboanga thence to Jolo. At present there is scarcely any telegraphic communication with Southeastern Luzon, owing to the persistent wire cutting. It is proposed eventually to connect that section and the larger islands adjacent by cable with Manila.

It appears to be settled that before the summer season arrives an automobile track will have been built at Newport, R. I., for the use of many racing and other machines which will be headquartered in that city during the summer.

A dispatch from Buenos Ayres, Argentina, states that a curious experiment was recently made there at the post office with Roentgen rays. About eighty parcels were addressed to importers of jewels. They were supposed to contain watches and jewels. The parcels were exposed to Roentgen rays for the purpose of ascertaining whether they contained jewelry. The importers protested against the opening of the parcels. The examination with the rays showed that all of the parcels contained valuable articles, such as gold watches and diamonds. This is regarded by the Government as an attempt at smuggling.

According to a cable dispatch from England, an inventor in that country claims to have perfected a method of utilizing air to supersede coal as a source of motive power. No details of the process are given.

Advices from London state that an invention which, if it may not go some way toward making lighthouses obsolete, is expected to be of much value in the prevention of shipwrecks was shown recently at Southend-on-Sea, before the marine authorities and navigators. They were all much struck by the possibilities of the invention. It is an automatic system of signaling, and will warn ships of their approach to dangerous rocks and coasts in all weathers, when a flashing light might not be seen and the boom of the foghorn might be unheard. A metallic conductor is fixed on an elevation ashore or a lightship or a reef or lighthouse. From this ætheric waves are transmitted over a zone which has a radius of seven miles. All vessels within that area fitted with receivers are warned of their proximity to danger. A bell rings and the receiving instrument records the name of the place which is being approached. The automatic part of the machine consists of steel bearings, with a number of teeth which pass over a Morse transmitter. No

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operators are needed at all. The machine works automatically. In its elementary principle the system resembles Marconi's wireless telegraphy, but in detail the system is essentially different. A syndicate is already taking up the invention, which will shortly be put on the market.

During 1901 the German Government proposes to begin the construction of a telegraph line to connect Dar Es Salam, in German East Africa, with Lake Tanganyika. This line, which will eventually join the Cape to Cairo wire, is expected to cost $50,000.

The "Tribuna" (Rome, Italy) of November 29th states that, after repeated trials at Brescia with a furnace of 150 hp., for smelting iron by electricity, a furnace of 500 hp. has been installed for the production of iron, steel, and other metals direct from the ores. The process is the invention of Capt. Stassano, of Rome, and the experiments were conducted before a commission composed of Profs. Arno, of the Polytechnic of Milan, Del Lungo, of the Institute of Spezzia, and Engineer Siracusa, Director-General of the Italian Electric Company of Turin.

On the line between Gesundbrunnen and Lagerhof, Prussia, an extended series of trials has been made of electric locomotives of large tractive effort says the "Railway and Engineering Review." This line has a great number of difficulties in the form of grades, curves and crossings, but is located so that the current used is generated by water power. An alternating current of 12,000 volts is supplied by overhead wires and is reduced to 1-12th its tension at the motor. The trials on this branch line have proved so successful that it is expected to extend the operation of the line in this manner to include a greater district.

An electric railroad equipped down to the minutest detail, is one of the features of this year's playthings for boys. The owner may get electricity from an ordinary battery or may generate it from a dynamo driven by a turbine connected with a running water faucet in the house. The current is let into the rail by a tiny wire from the battery or dynamo and is picked up by a motor concealed in the boiler of the engine. He can run it at a speed of 150 or 200 feet a minute, or he can just make it crawl. There are passenger cars and freight cars, switches and signal towers, stations and sidetracks.

The official report of the finances of the Paris Exposition shows a loss of 2,000,000f. ($400,000). The total of expenditures is 116,500,000f. ($23,300,000). The receipts amounted to 114,500,000f. ($22,900,000). The loss is less than in any of the preceding expositions.

A remarkable natural phenomenon has developed in Brooklyn, at Rockaway avenue and Pacific street. One of the tall hollow iron trolley poles set in the earth, on the northeast corner of the street, has filled up with pure spring water, which is constantly spouting over the top like a geyser. The water has covered the ground in the vicinity and has frozen, making a regular skating pond.

The J. C. Risher Coal Company has begun the operation of its new electrical mining plants at Dravosburg, Hays and Shire Oaks, Pa. The dynamo hauls 50 mine cars on the incline at a time. The capacity of the Dravosburg mines is increased from 16,000 to 20,000 bushels a day and but half the force of miners is required now.

A new electric machine was put up at the postoffice in Poughkeepsie, N. Y., a short time ago. It is used for cancelling stamps and at the same time puts the post-mark on the letters. It is run by electricity and has a capacity of stamping and postmarking 35,000 letters an hour. The clerks find it a great convenience.

By means of an invention, in which the magnetic electric machine is utilized to develop an induced current of a high potentiality, capable of acting over a long distance or through strong resistance, there has been developed a system of electric signaling which, by dispensing with cumbersome and costly batteries, bids fair to revolutionize modern telegraphy, and materially lessen its cost. Another application of the principle of the invention adds to the ordinary fire alarm system safety, surety and economy. As heretofore developed, the current has not been available for long distances or against strong resistance, and hence not commercially practical except in a small way. L. G. Wooley, of Kenton, O., has perfected this application of the principle involved. Its operation depends upon the fact that a sudden half turn, ending abruptly, of an ordinary single coil magneto armature in the field of a powerful magnet, sends out upon the line connected with it a current impulse, which may be raised to an extremely high potential.

It is interesting to note points of superiority in the automobile that appear under adverse weather conditions. Recently, when the streets were covered with a slime, horses were falling down and electric cars were sliding in all directions regardless of rails and brakes; but the automobiles made their way through the discord and there is yet to be a report of any disadvantages experienced.

In Germany cork is said to have been used with success in isolating the vibrations and consequent noise caused by machines installed in or near dwelling-houses. A sheet made up of flat pieces of cork in mosaic fashion of corresponding size to the bed-plate of the machine, and held together by an iron frame, is laid under the machine. The source from which this information is gathered also alludes to the isolation, by means of cork, of each bolt or connection between the bed-plate of the engine and its foundation, but does not describe in what manner such isolation is effected. It is, of course, apparent that the mere sandwiching of a sheet of cork between the bed-plate of a machine and its foundation would not necessarily absorb troublesome vibrations, since each anchor bolt is a medium whereby the vibrations of the engine may be transmitted to its foundation, and hence to the floor and walls of the building unless effectively isolated from the same. How this effective isolation is obtained by the use of cork sheeting remains to be explained. For our part, says the London "Electrical Engineer," we should be more inclined to rely upon a specially-prepared foundation of extra area and solidarity and to a careful balancing of the reciprocating parts of the machine.

A complete overhead trolley system for the carrying of freight is to be introduced at the Stanley Works at New Britain, Conn., and several thousand feet of track will be laid to connect all of the departments. Flat cars will be used and the company will furnish its own motive power. It is expected that the trolley line will be in operation by January 1.

Large shipments of electrical machinery and material continue to be made to Italy where the demand for such articles is greater than in any other country in Southern Europe. The steamer Aller had on board upwards of $30,000 worth of electrical machinery on her last sailing for Genoa. The same vessel took for Milan, besides good sized shipments of electrical goods, extensive consignments of laundry machinery, typewriters and cash registers. Merchants engaged in the export trade with Italy claim that more than 75 per cent. of the American manufactured goods which enter that country go through German or British account. In traveling through Italy they assert one will not find a single representative of an American manufacturing firm. The European merchants have even samples of American goods from which they effect sales. The engineering concerns who make direct shipments from here to Italy, it is stated, secure their orders through the European branches at either London or Berlin. If direct representation were established the trade, according to well posted parties in the business, would increase very materially.

Among the many Christmas novelties now shown is an electric automobile. It is 10 inches long and 7½ inches high. The battery is placed under the seat, where it can be easily reached. It will furnish power to drive the vehicle from half an hour to an hour without recharging.

The introduction of electrical traction on the elevated railroads of Chicago resulted in a substantial increase in the number of passengers carried. The increase in 1900 thus far over the corresponding period of 1899 is said to have averaged 12 per cent. Electrical equipment of the Manhattan lines will enable them to carry more passengers than now, and it is confidently believed that it will also attract a larger patronage, but the percentage of increase, it is thought, will hardly be as large as it has been in Chicago, owing especially to the already enormous volume of traffic on the "L" lines in this city.

American Society of Mechanical Engineers.

At the meeting of the American Society of Mechanical Engineers, held in New York recently, the following officers were elected: President, Samuel T. Wellman, Cleveland, O.; vice-presidents, David Townsend, Philadelphia, Pa.; Jesse M. Smith, New York City; James M. Dodge; Philadelphia, Pa.; Stevenson Taylor, Hoboken, N. J.; Arthur M. Waitt, New York City; Ambrose Swasey, Cleveland, O.; managers, Edgar C. Felton, Harrisburg, Pa.; R. H. Soule, New York City; John A. Brashear, Allegheny, Pa.; A. H. Goodale, Waltham, Mass.; Francis H. Boyer, Somerville, Mass.; Alfred H. Raynal, Washington, D. C.; W. F. M. Goss, Lafayette, Ind.; De-Courcy May, Scranton; Pa.; D. S. Jacobus, Hoboken, N. J.; treasurer, William H. Wiley, New York City.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 6.

A DAY WITH A WIREMAN.

We will record in this article a day's experience at wiring with a practical up-to-date wireman. He is not the man who comes to work every morning ten minutes late, armed with he familiar excuse of "trolley being blocked," and whose entire ambition appears to be to keep out of the way of the "boss" and can never see any farther ahead than the next pay day. This wireman is the "reliable" man who is sent out on all particular work, because the firm has confidence in him.

Our wireman's name is Tom Jones, and I was fortunate enough to be sent out as a "striker" with him. I will try to relate as closely as possible our experience during the day, dealing with the points that I think will be instructive to the practical worker.

"Jones, here are a couple of orders that I am particular about and I want you to take them."

Tom steps up to the desk and receives the orders which read as follows: Mrs. Brown, 11 North 27th street. Install push button at front door to ring bell in kitchen, also a "floor push" in dining room to ring buzzer in servants' entry. Mrs. Smith, 15 South 27th street. Bells out of order; repair.

We gathered up the necessary material, including wire, batteries, bells, sal-ammoniac, etc. Tom took his tool bag and some of the stock and I took the remainder and we started out. The material I had being rather inconvenient to carry I asked Tom to put the packages of sal-ammoniac in his tool bag. "No, sir. I would rather leave them in the shop and come back after them than carry that stuff in my tool bag. Don't ever put sal-ammoniac in the same bag with tools if you want good tools; it will rust them before you know it. Some of the other fellows do, but you ought to see their 'kit.' Why, I would no more think of trying to do a job with the tools that some of the fellows carry than I would of flying. There used to be a time when an electrician was equipped if he had a screwdriver, a pair of plyers and a jack-knife, but those days are past, and I tell you if you want to do good work you must have good tools to do it with. Wait until we get to work and I will show you the 'kit' I carry. This Mrs. Brown we are going to work for to-day is a little cranky, but I can get along with her all right. I'll give you a pointer. When you go to work for a party try and give them a favorable impression of yourself right at the start. Don't go up to the house as though you were ashamed of yourself and looking just as though you had been caught trying to steal the front gate. Try and make a good impression at the start, for then if you happen to get a little plaster on the carpet or something like that they are sure not to mind it, whereas if they do not like you from the first they'll be just nose'n around to catch something wrong and raise a fuss.

"Hello, this is No. 11. Good morning. Will you kindly inform Mrs. Brown that we are from Wire & Co. to do the electric work she ordered." The servant disappears and in a few moments Mrs. Brown enters. "Mrs. Brown, good morning. We hope we are not putting you to any inconvenience by coming so early." I was surprised at the way Tom talked, just as though he had called to a 5 o'clock tea or such like, but he assured me afterwards that it was a part of the trade, and to be a good, successful wireman it is about as necessary to be able to properly meet the people as it is to know how to do their work.

"John, show these men where they can leave their tools and wire." I took the tools and wire back to where John indicated while Mrs. Brown showed Tom where she wanted the bells and push buttons to be placed. After he was through we went down to the cellar and he said: "When you strike a new job don't be in a rush and get tools and wire scattered all over the floor before you know what you are going to do; just look around for a while and sort of get your 'bearings.' The first way you see to run the wires may not always be the best and it almost always pays to look around for a while."

While Tom was looking over the situation, figuring on the best means and ways for running his wires, I took occasion to look through his tool bag to see what tools a wireman should carry, for by this time my opinion of Tom's ability as a workman assured me that in all probability the "kit" he carried would be a complete outfit and an ideal one for a man engaged in that line of work. I kept a list, which was as follows: Two screwdrivers different sizes, one pair long nose plyers, one pair diagonal cutting plyers, one pair flat nose 5 inch plyers, one small keyhole saw, one 20-inch cross-cut saw, a ratchet brace with about a half dozen long bits of various sizes, a long flat steel wire, which I afterwards heard Tom call a "fish-wire," a stout jack-knife, one small alcohol soldering torch with soldering iron, two wood chisels, one medium sized hammer, a bottle of shellac, one pair of 6-inch gas plyers, one ½-inch star brick drill, one long brad awl, a two-foot rule and a telephone receiver. Beside this collection of tools there were a couple of small bags containing assorted screws, nails, insulating tape, solder, a ball of stout twine, etc.

Before we started to work Tom volunteered the following information, which is a good rule for guiding wiremen in work of this class: "Run a wire from one pole of the battery, connecting it to one side of every push button, and a wire from the other pole of the battery to one side of each bell or buzzer, then connect a direct wire from each push button to the corresponding bell or buzzer to be rang by that individual button."

During the installation of the bells for Mrs. Brown I noticed the following points relative to the work which I think it will be well to remember. In putting up vibrating bells always place them with the gong pointing downward, for then there is not liable to be an accumulation of dust settle in them through the opening in the shell where the vibrator works.

Where push buttons are placed outside, exposed to the weather put a coating of shellac on the surface to be covered by the button and also surrounding the edge of it, when mounted, to prevent dampness attacking the wires and causing trouble.

Always do concealed wiring where possible by "fishing" through the partitions to the cellar. This is done by making a fine hole through the plaster where the bell or button is to be placed; then drop a string, with a lead weight attached down the space inside, and allow it to tap on the ceiling of the basement; by this means the exact spot can nearly always be found, then by boring up through the cord may be secured, to which attach the wires, pulling them up by it.

Never place the batteries in a warm place or up between the "sleepers". Try and secure a cool spot where they will be convenient of access. After the batteries are set up always wipe the tops of them perfectly dry.

Keep away from damp places with the wires and do not fasten them up with double pointed tacks, but instead use a more modern method, such as small specially constructed wooden cleats. When open work has to be done in a room a very fine wood moulding corresponding to the interior finish is advisable.

Always tape and shellac wires where they go through holes in plaster.

Never start to bore a hole in floors or walls without first investigating the conditions where you expect to come out at on the other side.

When we had completed and thoroughly tested the work at Mrs. Brown's we went to Mrs. Smith's to repair the bells. She informed us that the batteries had been fixed up just a few weeks previous, but when we looked at them they were entirely worked out. A great many wiremen would just have renewed the batteries and let it go at that, but Tom surmised at once that there must be a leak somewhere to cause them to run out so soon. so after renewing the cells he took his telephone receiver, connecting it in series with the circuit, and tapping one of the contacts discovered that there was current going to waste somewhere. The old method was by "tasting" for a leak in the circuit, but Tom had abandoned that for the more modern and a great deal more accurate means of using a telephone receiver.

We soon discovered the cause of the trouble, which existed in a damp point where both wires were under a double pointed tack. After remedying this trouble and testing again to make sure that no further trouble existed we packed up our tools and returned to the shop, satisfied with our day's work.

While reflecting over the day's experience I came to the conclusion that if all wiremen would use the same caution and good judgment that our friend Tom did the trade would be benefited to a great extent and we would not so often see the card on the front door which reads—

"Bells out of order. Please knock."

Article No. 7 will be entitled "Instruments for Electrical Measurements."

Rapid Transit in Constantinople.

Several enterprising Turkish capitalists are considering the feasibility of installing a system of electric street cars in the city of Constantinople. If a franchise can be secured such as the companies operating in American cities enjoy it is almost certain that the scheme will be carried out. M. Iran Cidzebcarn, a prominent miller of Constantinople, who has lately been in St. Paul, Minn., says he believes there is a great need for rapid transit in Contantinople and that soon modern conveniences will be in vogue there.

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THE TELEGRAPHONE—A MAGNETIC SPEECH RECORDER.*

BY VALDEMAR POULSEN.

Following is a description of the principles and the arrangement of my invention which I have called the telegraphone. A steel wire (piano wire) AB, about 1.5 m., 5 feet long and 0.5 mm., one-fiftieth inch in diameter is stretched on a board, Fig. 1. Along it can slide the electromagnet E, which embraces it with one of the poles, Fig. 2. The core of the electromagnet is a piece of soft iron wire about 8 mm. (one-third inch) long and 0.75 mm. (three one-hundredth inch) in diameter, and the electromagnet itself is in series with a battery and a microphone, or is connected to a transformer in the microphone circuit. At the beginning of an experiment the wire should be completely unmagnetized.

If, while the electromagnet is sliding along the wire with a velocity of about 1 m. per second, the microphone is spoken into, the current fluctuations produced register themselves by means of the electromagnet on the steel wire. If now the electromagnet is connected up with a telephone and made to travel over the wire again, the telephone repeats what was spoken into the microphone. Thus, owing to the great coercive strength of steel, there has been impressed on the wire in undulations, so to speak, of magnetization, a kind of writing which is permanent, and faithfully

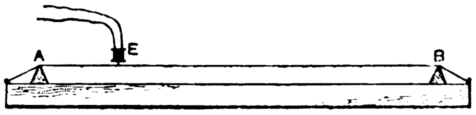

FIG. 1.

records the articulations of the voice. When E is put, now, in direct connection with a moderately strong battery and is made to pass once more over the wire the magnetic writing is obliterated under the influence of the constant magnetizing force, which is great compared with the intensity of the writing magnetic forces.

The wire AB is too short to contain many words. In order to obtain a larger capacity a very long piano wire is wound very firmly round a drum having a fine spiral groove on its surface, and the piano wire follows this spiral groove. Parallel with the axis of the drum there is a rod upon which a kind of sleeve can slide. The electromagnet is fastened to this sleeve. When the apparatus is in operation, the electromagnet embraces with one of its poles, or with both, the steel wire, Fig. 3, and during the rotation this steel wire itself pushes the electromagnet and the sleeve along the rod. It is very easy to handle a drum of this kind, and the whole arrangement is very convenient for experiments. Of course, it must be borne in mind that in the various telephonic and telegraphic applications of the telegraphonic principle there are certain conditions which must be fulfilled. The nature, dimensions, and cost of the writing basis, and the velocity, the construction of the electromagnet and the magnitude of the current must all be considered. Without going into details here I only beg to direct the attention upon some essential points concerning the three proceedings, viz., the inscription, the reproduction, and the obliteration.

Most frequently the inscription is effected by means of a polarized electromagnet. but the polarization and the degree of the polarization must not be arbitrary. Let, for instance, the electromagnet, by means of which the writing is to be performed, obliterate a prior magnetic record and also simultaneously magnetize the writing basis. Then during the inscription the electromagnet is given the polarization opposed to that which it had during the obliteration. In this way a lively movement of the molecular magnets is obtained at the very moment of forming the writing. The susceptibility seems to increase very much in that magnetic status nascendi, and every shade of

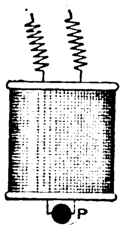

FIG. 2.

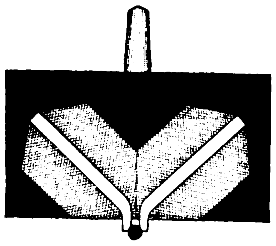

FIG. 3.

the writing becomes extremely perceptible. Ordinarily the polarization of the writing magnet is only a very small fraction of that of the obliterating one. The nearer its polarization approaches to the neutralization of that of the writing basis, however, the feebler may be, of course, the polarization of the obliterating magnet. The coercive force determines the degree of polarization which exactly neutralizes the magnetization of the writing basis. It is found that the writing is somewhat weak when the polarization of the electromagnet during the process of inscription is just equal to that used in the preceding obliteration. In order to polarize the electromagnet a constant current or a permanent magnet may be used.

If the positive and negative curves of an alternating current differ, their faculty of producing the writing may equally differ. This explains the peculiarity that the direction of the primary current with a certain polarization of the writing basis may sometimes influence the writing which, in the secondary

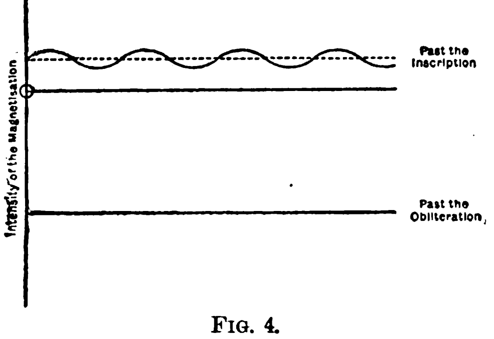

FIG. 4.

circuit, is performed by an unpolarized electromagnet. This is owing to the lack of uniformity in the manner in which the resistance of the microphone is increasing and diminishing. The inequality here spoken of is perhaps the more considerable the more the mobility of the carbon granules is considerable.

It seems that a speech (or a song) inscribed on the wire may be reproduced indefinitely without any perceptible diminution in clearness, the tone of the voice remaining perfectly distinct. Even when the apparatus is as primitive as that of Fig. 1, the reproduced voice is distinguished by the highest clearness and purity, and free from disturbing accompanying noises. The telegraphones of more recent date are able to reproduce with the greatest exactitude not only words spoken or sung into the microphone, but also whispers and even the feeble sounds of respiration.

The writing is completely obliterated by passage through a magnetic field of sufficient strength. Ordinarily it is sufficient to let the writing basis pass the writing magnet or another small electromagnet energized by a current from two or three cells. If a speech, however, be inscribed by means of an unpolarized magnet on a writing basis already written upon there results, as a rule, not an obliteration, but an interference.

Besides common piano wires, steel ribbons and nickel wires have been used as writing bases. The dimensions of the steel ribbons were 3 mm. × 0.105 mm. (one ninth-inch × one-fiftieth inch). The steel ribbon passes from a roll to a second receiving roll, where the layers of the ribbon may cover each other without the writing being destroyed. As to this last point, it has been proved by experience that the magnetism does traverse the ribbon, though as a rule, there is sufficient air space between consecutive layers to afford nearly complete protection. With a speed of about 1 m. (3 feet) per second, 0.154 liter, one-fiftieth cubic foot of steel is needed for a speech lasting an hour. Instead of ribbon, a fine piano wire unrolling from one place to another may be used. In some cases nickel may with perfectly good effect be used as a

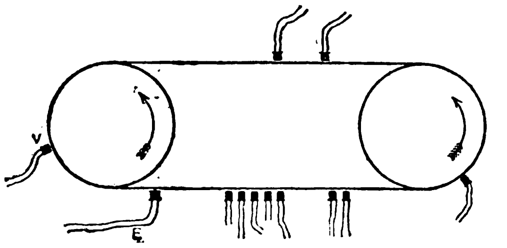

FIG. 5.

writing basis, which fact is in accordance with the known properties of this metal as regards permanence for weak magnetizations, and demonstrated by A. Abt. The great dependence on mechanical influences which is characteristic of the magnetic state of nickel demands, however, careful handling of the nickel wire. It is not likely that the common steel used hitherto is exactly the most suitable for telegraphonic purposes; most probably other and better kinds are to be found.

I have no intention of speaking of all the various specifically phonographic applications of the telegraphonic principle, nor of the constructive differences in connection with such applications. Nevertheless, I think that the following arrangement ought to be sketched: A long steel ribbon is stretched between two rolls which can rotate at a rather considerable speed. The ribbon passes a series of electromagnets of a speed regulated according to the circumstances. The electromagnet E inscribes words, music, etc.; the other electromagnets—"the reading magnets"—reproduce the communications in the telephone of each hearer; and, finally, the obliterating magnet, V, equalizes the magnetic variations of the ribbon ("telephonic newspaper," Fig. 5.) As using does not weaken the writing, we are able to intercalate any number of reading magnets.

Again, it is possible to use the telegraphone to increase the telephonic current (telephonic relay). The engineer, E. S. Hagemann, has proposed an arrangement which, theoretically at

*From the "Electrician," London.

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east, is very simple, and which I here describe. A drum is provided with a series of circular steel rings having their centers in the axis of the drum, their planes perpendicular to the axis. As the drum rotates, whatever is spoken into the microphone is inscribed on the first ring by means of a writing magnet. By means of a series of reading magnets placed on the first ring, the words are transmitted to the other rings, which synchronically carry their equally formed writings past their reading

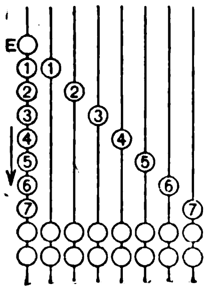

Fig. 6.

magnets, duly connected together, and afterwards past obliterating magnets (Fig. 6).

An elegant method of compensation has been invented by the engineer, P. O. Pedersen, and allows several speeches to be intermingled, is that they can afterwards be reproduced separately. As it is not feasible to describe this method satisfactorily in a few words, I shall not speak further of it here. Later, perhaps, Mr. Pedersen himself will make a communication about it.

In my endeavors to develop the telegraphone I have received the greatest assistance—first from Mr. P. O. Pedersen, and also from Mr. E. S. Hagemann. I owe them both my best thanks. I have, besides, to thank the Institution and experts abroad, as well as those of my own country, for the interest they have shown in the telegraphone.

POWER AND LIGHT FOR THE MACHINE SHOP AND FOUNDRY.*

BY FORREST R. JONES,
Worcester, Mass.

Although there have been several papers read before this Society upon electric power transmission for the machine shop and foundry, and the discussions thereon have been extensive and interesting, the question is of such growing importance that it is believed that more attention can be very advantageously given to it. Some of the papers and discussions have taken up lighting in connection with power transmission, but this has not generally been the case. The two are frequently so closely connected, however, that one often cannot be fully studied without the other. The writer has recently had occasion to investigate the plants of two concerns with regard to electric power transmission and light. In one of these, the floor space over which light and power are required is about seven acres; in the other, about four acres. The arrangement of the floor space is radically different in the two cases. In the first, there are several buildings entirely separate and at some distance from each other, and the floor space is nearly all upon the first floor, there being a small amount upon the second floor, and next to nothing on the third floor. In the second, the floor space is almost all in an L-shaped building, partly of four stories and partly of three, and, in addition to this, a small two-story structure setting close to the other building within the inner angle of the L.

The output of each establishment is in a way similar, both producing iron machinery chiefly. In the smaller establishment, the product is much lighter in weight than in the larger. The operating machinery in the two plants is quite similar, the lighter machinery is about the same in each, but the larger has a considerable amount of heavy machinery which has no counterpart in the smaller. Both plants were examined to see what requirements would have to be fulfilled by an electric system, or systems, for power transmission and lighting. The first examination was made with a view to determining whether one or more kinds of current (of the direct, single-phase alternating or polyphase class) would be desirable. In both cases the same conclusion was reached, namely, that the most feasible way to meet all requirements would be to adopt either one or more systems of electric circuits, the current to be of the same kind in each system if more than one were used, such that any electrical apparatus to be used in the plant, when placed in the location fixed for it, could be individually and conveniently attached to the electric circuit at a near point and operated by current therefrom in a manner suitable to the requirements of the service the apparatus was designed to perform and the limitations of the service for the particular locality, the latter to allow for taking into account the fact that, at some places, a motor must run with a speed varying but slightly from uniformity, while at other places, and for other services, considerable variation of speed might not be objectionable; also, that while the electric light, might in some places, be required to operate with a uniform brilliancy and absence of fluctuation, as in an office or drafting room, there might be other places to illuminate, such as the foundry, casting-cleaning room, or an emery wheel, where a very considerable variation in its brilliancy would not impair its usefulness.

The selection of a single system from which all apparatus might be operated was based upon the conviction that, for machine shop and factory purposes, it is exceedingly desirable to be able to interchange similar apparatus and to place any piece of apparatus anywhere upon the system, thus obtaining the maximum flexibility and greatest facility for operating portable machine tools at any point, and also to allow for alterations and extensions of the works. The study of the requirements of every form of apparatus that might be brought into use and demand current from the system was naturally necessary in order to decide whether direct current, single-phase alternating, or polyphase, should be used.

The oldest of machine tools, the lathe, was taken up first, and since in both establishments it was deemed advisable to have some lathes driven individually by variable speed motors, and that the variation of speed should cover, by small steps, a considerable range, the only thing that seemed satisfactory for this purpose in the present state of speed regulation for different types of electric machinery was the direct current. And, in order that the range of speed variation might be as great as possible, the multiple voltage system appeared to be advisable, even though the speed regulations were to be made, for a given supply circuit voltage, by rheostatic control of the current in the magnet coils of the motor.

Other machines of a nature in a way similar to the lathe, so far as their driving is concerned, among which may be included the boring mill, drill press, shaper, slotter, gear cutter and screw machine, can be operated satisfactorily under conditions of speed variation similar to those which answer for the lathe.

The planer, whose reciprocating motion requires the reversal of nearly every part of its machinery, presents a problem which is not yet satisfactorily solved for electric driving by a direct-connected motor. The nearest solution that has been reached is to drive its countershaft in one direction continuously, just as it might be driven from a line shaft, and effect the reversals of the machine in the ordinary method common to mechanical driving. The ability to secure different cutting with maximum return speeds for machines of this type is unquestionably desirable when working upon different kinds of materials or for taking heavy and light cuts. Different speeds can be obtained readily with many types of direct-current motors by rheostatic control of the field magnet current, and, therefore, this feature needs no further attention than already given the lathe.

Nearly all electric hoists and cranes are now operated by constant-pressure, direct-current motors. They seem to be at least as satisfactory as those driven by any other type of current.

Constant-potential, direct-current arc lamps have long shown themselves efficient, durable, and otherwise satisfactory. They can be operated individually and economically at any pressure between 100 and 125 volts, even though the pressure fluctuates considerably. (It is not intended that these are the limiting pressures of satisfactory service.) The lamp is, of course, more economical at its rated pressure without any of its rheostatic resistance in circuit. Incandescent lamps have long been operated at from 100 to 110 volts with perfect satisfaction.

Motors for electric cranes and for general power purposes about the machine shop can be operated satisfactorily at any of the ordinary pressures for running motors, but it was not thought advisable, especially in connection with conditions to be met in operating other apparatus, to give them a pressure greater than from 220 to 250 volts. The higher the voltage, within practical limits, the greater the economy of wire in the electrical circuit, of course. But, even leaving the requirements for other apparatus out of consideration, voltage as high as 500 is not desirable for the machine shop and foundry, for there is always a considerable degree of probability that employes will receive shocks by coming in contact with the wires or machinery. The writer's experience has given him sufficient respect for a 500 volt circuit to make him wish to keep others away from it.

On the whole, it was, therefore, concluded that 220 volts for the majority of motors, and 110 volts for arc and incandescent lamps, would be the most suitable. These voltages can be obtained, as is well known, by the three-wire system which has been so long in use.

In order to obtain information as to the amount of power required for driving different parts of the plant, numerous tests were made upon individual machines, groups of machines, sections of line shafting, cranes and elevators. Although so much data have already been published showing the power required to drive

* Abstract of paper read at the New York meeting, December 4-7, 1900, of the American Society of Mechanical Engineers.

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machine tools for iron working and wood working, it is believed that there are some points of sufficient value among that obtained in these tests to entitle them to attention. The data given below are of a nature not generally found in the reports that have been made upon electric driving, but present some rather unusual cases.

The power required to drive a couple of lathes, one of 48 inch and the other 36 inch swing was taken when both were polishing hollow cylindrical columns, one 10 inches in diameter, and the other 12 inches. In both cases the polishing laps gripped the work so tightly as to keep the driving belt of each lathe on the point of slipping. The speed was as high as could be safely used for machines of this size. To drive the two lathes together under these conditions, something over seven mechanical horse-power delivered by the motor to the belt running from its pulley was required. It can be seen that this is considerably more than is required for a lathe performing any of the operations common to machine construction in the ordinary shop. It may not equal the amount of power necessary for taking heavy cuts upon large steel shafts, heavy gun tubes and jackets, etc. It does represent the power, however, which must be used as a basis to determine the size of a motor to drive a lathe which must do such work as demanded for these two. If a number of lathes for this class of work are to be grouped together, and there is a possibility, which is very probable, that several of them may have polishing under way at the same time, and therefore demand a maximum amount of power, the motor for driving them as a group must naturally have a capacity equal to the combined maximum demands of all of them, due allowance being made for its ability to stand overloading for a short period of time.

Although it is well known that the power required to drive a metal-working planer is generally greater on the return stroke than for the forward, or cutting stroke, and that, at the time of reversal, the power demanded is exceedingly greater than at any other time, the following data may not be out of place.

Two planers, one with 22 foot table and 120 inches between housings, and the other with 25 foot table and 72 inches between housings, were both driven by one motor belted to a jackshaft, which in turn drove the two countershafts of the planers. The following data were obtained:

120-INCH PLANER WITH 22-FOOT TABLE AND 72-INCH PLANER WITH 25-FOOT TABLE.

(Both machines driven by one motor. Jackshaft running in all cases. Pressure 230 volts.)

Amperes.	
20	One countershaft.
60	Average for 120-inch planer on cutting stroke, light cut, and one countershaft.
55	120 inch planer reversing from return to cutting stroke.
110	120 inch planer reversing from cutting to return stroke.
27	Both countershafts.
240 } 250 }	Both planers reversing from cutting to return stroke.

Both machines were working upon rather heavy castings and taking comparatively light cuts at short strokes over bosses and parts of the castings where other members of the machines were to be attached. The power, therefore, is approximately that which would be required to drive the machines without taking any cut, but carrying loads upon their tables. It may be noticed that the amount of power for reversing the 120-inch planer was about 1.8 times that for its average running at time when not reversing. When it happened that both machines reversed at the same time from the forward, or cutting, to the back, or return, stroke, the power required ran up to a very great amount, more than 60 mechanical horsepowers. This amount of power was not indicated by the instantaneous extreme throw of the ammeter needle, but was the reading at which the ammeter stood steadily for some seconds, a period long enough to make the demand distinctly felt by the engine and generator.

A planer with a 40-foot table and 74 inches between housings gave the following data. The great power required for reversing from the cutting to the return stroke again stands out:

74-INCH PLANER WITH 40-FOOT TABLE.

Cutting speed, 20 feet per minute; two tools operating on cast iron; cut on each, ½ inch deep, ⅛ inch feed. Pressure 234 volts.

Amperes.	
22	Countershafting only.
50	Considerable portion of the time while cutting.
60	For some moments while cutting.
35	Middle of return stroke.
90	Reversing from return to cutting stroke.
120	Reversing from cutting to return stroke.

Of the twenty odd traveling cranes in one establishment, ten were tested for the power required to drive them. Of these ten, some were driven electrically and some mechanically. The majority of the electrical cranes were of the ordinary types designed for electric driving. One was a remodeled crane which had originally been driven mechanically by a square shaft running alongside the building parallel to the track. Some of the mechanically driven cranes were furnished power by a square shaft alongside the building and parallel to the track, and others by a flying rope running alongside the track. Obviously, in providing for the power to drive a crane it is necessary to know the maximum amount of power that it may demand for a period of time great enough to make the demand appreciably felt by the generating plant. In this respect the following data, obtained from three electric traveling cranes of 30 tons capacity each, all traversing the same track above the foundry floor, show how great may be the demand, for an appreciable period of time, by some one of the cranes, and, with perfect possibility, by all of them at the same instant.

Each of the 30 ton cranes was equipped with four motors, 25 horse-power for bridge travel; 8 horse-power for trolley travel, 25 horse-power for the main hoist, and 16 horse-power for the auxiliary hoist.

30-TON ELECTRIC TRAVELING CRANE NO. 1.

(Pressure 240 volts when crane was taking no current.)

Amperes.	
125	Bridge starting, no load.
50	Bridge traveling uniformly, 350 feet per minute, no load.
33 to 40	Lowering, no load.
105	Starting to hoist, no load.
36	Hoisting uniformly, no load.
145	Bridge starting, 20-ton load.
50	Bridge moving uniformly, 240 feet per minute, 20-ton load.
95	Hoisting 20-tons uniformly at 10 feet per minute.
310 } 200 } 150 }	General manœuvring, 20-ton load.

30-TON ELECTRIC TRAVELING CRANE NO. 2.

(Pressure 240 volts.)

Amperes.	
110	Bridge starting, no load.
65	Bridge traveling uniformly, 450 feet per minute, no load.
15	Trolley starting, no load.
13	Trolley moving uniformly, no load.
36 to 50	Lowering, no load.
130 to 150	General manœuvring, no load.
90	Bridge starting, 20-ton load.
50	Bridge traveling uniformly, 20-ton load.
145	Hoisting, rapid start, 20-ton load.
115	Starting to hoist, reading for 3 seconds, 20-ton load.
95	Hoisting 20 tons uniformly at 10 feet per minute.
260	Bridge and trolley starting, reading for a few seconds, 20-ton load.

30-TON ELECTRIC TRAVELING CRANE NO. 3.

(Pressure 240 volts.)

Amperes.	
90	Bridge starting, no load.
50	Bridge traveling uniformly, 535 feet per minute, no load.
38	Lowering uniformly, no load.
40 to 45	Hoisting uniformly, no load.
150	Bridge and trolley starting, 20-ton load.
30	Trolley at uniform speed, 20-ton load.
34	Hoisting uniformly at 11 feet per minute, 20 ton load.
240	Bridge and trolley manœuvring, reading for 3 seconds, 20 ton load.
320 } 250 } 200 } 230 } 180 }	General manœuvring, 20-ton load.

It can be seen, by examining the data obtained from these 30 ton cranes, that when all the motions on one were in operation simultaneously, and when two or more of the movements were started at about the same instant, the demand made for power during this general manœuvring was very great indeed. The readings given for such general manœuvring for two of the cranes when carrying a load of 20 tons each, the reading running as high as 320 amperes in one case and 310 in the other, represent demands for current during periods of from five to ten seconds' duration, as shown by the steady reading of the needle of a dead beat ammeter. It not unfrequently happens that such a condition comes about in everyday practice. That two or more of these cranes did, when in regular service, make very heavy demands for current at the same instant, was clearly shown by watching the ammeter at the switchboard of the generator supplying current to the three cranes only. Although this generator had sufficient capacity to operate several 30-ton cranes under what might be called average load, and the magnetic circuit breaker for the generator was set considerably above the steady-load capacity of the generator, it was not an unfrequent occurrence for the circuit breaker to open up the circuit on account of the great momentary demands made for power by the cranes.

Tests upon a 15 ton electric crane, two 5 ton electric cranes, a 15 ton flying-rope crane, a 15 ton square-shaft crane, and a 15 ton square-shaft crane remodeled to be driven direct by an electric motor, all showed similar heavy momentary demands for current under general manœuvring.

By examination of the data given above, it may be seen that the constantly recurring and great momentary demands for power made by cranes and hoists would necessarily affect the pressure in the wires carrying current to them from the switchboard in the power-house.

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Hence the circuit feeding the crane would not be suitable for also furnishing current to motors which require to be run at even a fairly constant speed, or even hardly for incandescent lights in places where a steady illumination is not essential. It would be difficult to find constant voltage arc lights that would operate with even a fair degree of satisfaction at the points of greatest variation of pressure in the circuit. It, therefore, becomes necessary to have what might be called a "crane circuit" for at least the majority of the larger cranes in an establishment of the proportions of those mentioned earlier in this paper.

The incandescent lights for use in offices, drafting rooms, and possibly some parts of the shop itself, as the tool room, and where the small and more accurate parts are manufactured, must have a pressure in the circuit leading to them which, at least, does not fluctuate rapidly, even though it may be allowable for it to vary slowly to a slight extent. A "lighting circuit," primarily intended for incandescent lighting, therefore, also becomes a necessity.

Such machinery as lathes, drill presses, shapers, milling machines, slotters and gear cutters do not ordinarily need to be driven at a speed that is even very uniform. Variation of speed on each side of the normal is allowable to a considerable extent in many cases, provided the variation is not a jerky one, such as often comes on line shafting used to drive heavy planers. A third circuit, primarily intended for driving machinery of this class, needs to be installed. This may be conveniently referred to as a "machine-tool circuit."

Whether an iron-working planer may be placed upon the machine-tool circuit depends largely upon the size of the planer. The heavier machines, on account of the great momentary demands they frequently make for power would be apt to produce sudden and considerable variations of pressure in the machine-tool circuit. Better general operation of the entire plant can be obtained by placing them on the crane circuit. The smaller planers can safely be placed upon the machine-tool circuit, thus obtaining more uniform motor speed for driving them, while not materially affecting the pressure in the latter circuit.

The pressure on the machine-tool circuit would remain constant enough to operate constant-pressure arc lamps with perfect satisfaction. Such lamps, therefore, may be placed anywhere upon either the machine-tool circuit or the lighting circuit, and possibly upon some parts of the crane circuit where the fluctuation of pressure is a minimum for that circuit. Incandescent lights can, of course, be placed upon any of the circuits. The pressure in the machine-tool circuit should be sufficiently constant to insure a brilliancy uniform enough for many places in which an incandescent lamp is put.

Important New Developments in Electric Automobile Building.

Public announcement has just been made of the perfectment of a light, comparatively inexpensive storage battery of unusually high efficiency, which is quite likely to cause a revolution in the methods of electric automobile construction. Heretofore the great stumbling block in the way of builders of electric wheels has been the cumbersomeness and great weight of equipment which the batteries heretofore used have necessitated. Now comes a Cleveland, O., electrician of wide reputation on two continents, with a perfected electric storage battery, upon which he has experimented quietly for five years and which is said to be made from entirely new and wonderful chemical combinations—materials new to science—developed only after years of patient labor and study, carried on at Cleveland.

The early forms of this battery have already withstood two years of severe service. The battery is extremely light and simple in construction, a very light one having driven an ordinary heavy electric automobile over a hundred miles on one discharge, covering average country roads and hills, as well as city streets and boulevards.

In achieving these results the inventor has utilized the work of the highest authorities in the field of chemistry in England, France and the United States, personally directing the work of experimenting in the home laboratories of these eminent scientists.

With this new battery, the heavy, cumbersome equipment and design of electric carriage now in use is no longer necessary, as the battery itself is of such light, yet strong, construction. From a scientific standpoint it is said to have an ampere efficiency of practically 100 per cent., and a higher curve of discharge than any battery heretofore known, being at the same time comparatively inexpensive to manufacture.

So strong have the claims for this battery proven that the whole series of patents covering it, together with other valuable and broad patents covering important features in automobile construction, electric motor gearing, motor suspension and mounting, and the simplest and most durable form of automobile trucks and running gears, have been disposed of to the American Bicycle Company, for a princely consideration. In fact, this company has already entered into extensive plans for the immediate and rapid construction of the new batteries, the use of which will at first be confined to vehicles of their own manufacture.

President Coleman was seen and found to be intensly interested in the subject, and highly elated over his company's success in securing the prize.

Through him it was learned that the inventor is Mr. Elmer E. Sperry. While it has been known for some years that he has been engaged on important work in this field, it is only recently that the results have been made public. He has been engaged in electric traction work ever since the earlier electric street cars were operated. He was the engineer for the syndicate which made the first bid for operating the elevated roads of Chicago by electricity. He has conducted some of the most important and difficult installations of electric mine locomotives of his own construction in various parts of the country, and is thoroughly familiar with electric traction in all of its forms. Mr. Sperry was one of the earliest to apply and adapt electricity to the operation of road vehicles, and among the patents becoming the property of the American Bicycle Company in this connection are a number of broad, basic patents.

The Sperry system of controlling automobiles by a single handle in place of a multiplicity of levers and foot treadles, is better known in France and England, where it has been widely adopted, than in this country, and has there received the endorsement of the leading automobilists. The natural manipulation of a single handle is found to vastly simplify the operation of the vehicle, entirely preventing confusion and the use of the wrong lever in times of emergency.

The Electrical Outlook in Siam.

Hamilton King, Consul-General at Bangkok, Siam, has sent the following report to the Department of State:

"The three companies that import electrical upplies report that their business has more than doubled during the last twelve months, while to my personal knowledge their orders during the last two months have exceeded those of any twelve previous months. There is a large and rapidly increasing business along this line in Bangkok, Siam, and there is no reason why the United States should not get a generous share. The tendency is toward the American market.

"The orders for the entire supplies for the new tramway, during the last two months, have been placed in the United States, with the exception of the rails. The order for the rails went to England, because the company thought they were unable to secure the peculiar kind they wished in any other country. This however, I believe is largely due to want of information on the subject, a cause which more familiar acquaintance with our manufacturers will no doubt set aside.

"A large quantity of the American electrical goods used here comes through London and European houses. This is another obstacle that can be removed by our manufacturers placing themselves in direct communication with importers here. American goods are in favor and the prices suit. The importers complain of American lack of promptness in attention to business. While goods are delivered here in three months from the time they are ordered from Europe and England, seven or eight months, and sometimes more, are consumed in getting them from the United States. This delay should be remedied. It is within my knowledge that answers to important cables have been delayed a full month.

"I quote from a letter just received at this office from one of the leading importers of this city:

"'My experience in doing business with the United States for the last ten years is that generally, in the United States you get for the same money a better article than in most European countries; but, with a few exceptions, American firms are not prepared for business with distant countries. Some of them have not even a cable address, and nearly all are slow and unsystematic in their correspondence. Shipping arrangements to Siam are also defective, as much as four or five months sometimes elasping between shipments from New York, whence we get most of our goods, and arrival in Bangkok. In consequence, we often prefer to order dearer or inferior articles from Europe to avoid delay and uncertainty.'

"The packing of the goods, I am pleased to report, has been materially improved during the last year. While one lot has come in a most unfortunate condition, yet the importers on the whole report satisfaction in this line now. It is to be hoped that the improved condition of shipping with all the far East that will come with our more direct communication with the Philippines will remedy some of these difficulties; and this, together with attention

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on the part of our manufacturers to those points to which reference as already been made in this article, will put America in possession of her share of this trade in Siam.

"The leading importers of electrical supplies in this city are the Siam Electricity Company, Limited, the Siam American Trading Company and the Bangkok Dock Company."

LONDON NOTES.

(From our London Correspondent.)

New Electrical Projects.

Friday last, November 30, was the last day for registering applications for Parliamentary powers to be considered during the next session. Those filed include 103 provisional orders for electric lighting, 26 directly affecting electric tramways, and many which include electric traction among many other powers sought. Electric underground railways affecting London are as plentiful as blackberries in autumn. They are to run in all directions if Parliament allows them and the investing public furnishes the $300,000,000 which they are roughly estimated to cost. Certain London authorities are expressing the opinion that there should be some uniformity or system, co-operation of interests or general inter-connection in the laying out of London's great basement. Several electric power distribution schemes are on foot and appear to have some prospect of acceptance after the success of the schemes introduced last year.

Electric Traction on the Underground.

The Joint Traction Board of the Metropolitan and District Railways on Dec. 3 opened the tenders which have been submitted by English, American and Continental firms for working the line electrically. The proposals were considered for a time, but no definite action was taken in view of the important issues involved.

"Science and Engineering."

The London Institution of Electrical Engineers held its first annual dinner at the Hotel Cecil last night (December 3). Prof. Perry presided. Lord Kelvin responded to the toast "Science and Engineering." He said that all other branches of science and engineering had taken thousands of years to grow, but there was nothing in the discoveries or inventions of ancient times that led up to electrical engineering. It was a product, not merely of the nineteenth century, but of the last thirty years. He was convinced that there was a great future before it. Prof. Perry, who responded to the toast of "The Institution," said that the electrical profession was as yet but a baby, and the members of the Institution were the nurses, as ignorant, he might say, of what the babe was going to be in the future as nurses usually were. Among the other speakers were Mr. S. Z. de Ferranti, Lord Alverstone, Mr. Swinburne and Professor Rucker. Lieut.-Col. Crompton testified to the valuable services rendered by the Electrical Engineer Volunteers in South Africa.

The Electric Service of the Baltimore and Ohio Railroad at Baltimore

When the great double track tunnel under the city of Baltimore was constructed to shorten the route of the Baltimore and Ohio Railroad between New York, Philadelphia and Washington, the railroad company was the first to employ the services of electric locomotives for the handling of trains in the city limits. The ponderous engines are at present operated by means of the trolley system, getting their power from overhead wires.

The great cost of maintenance of this system and the consequent care in keeping it in repair, has induced the company to install the third-rail system, and work is progressing rapidly towards its completion.

The electricity is furnished by an electrical plant, which not only furnishes the power for the operation of the locomotives, but also the light for all of the Baltimore and Ohio properties in the city, as well as several private concerns.

In order to utilize all of the current and take up the surplus of electricity that is generated at the power house at moments when the locomotives or lights are not used, an enormous storage battery will be used, which will consist of 320 tanks made of hardwood lined with lead, each tank holding 39 plates, 19 negative and 20 positive. Each tank will weigh, with plates and electrolyte about 1,800 pounds, and the complete battery will have a capacity of 1,200 horse-power for a short period of time.

When the battery is put in service it will act as a reservoir of power, accumulating electricity while the locomotive is not in action and relieving the station of the load above the average by discharging into the line this accumulated current. To effect this, the station is only connected to the line through a booster, which is the combination of a motor and a generator. The generator is put directly in the circuit and is so designed that it only allows a certain amount of electricity to pass from the station to the battery and line. When the locomotive is not in service this current goes through the battery and charges it. When the locomotive is put in service the current is diverted to the line, and as by the nature of the apparatus no more can come from the power station, the battery must give out the extra current to operate. Thus the station will be operated at a greatly reduced and highly economical rate, and the extra power dispensed with may be put to other useful purposes.

When the battery is installed and the new third-rail system is placed in operation the railroad company will have, according to electrical experts, the most modern system of heavy electric haulage in the world.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Brandon (Man.) Electric Light Company is now building a power dam on the Little Saskatchewan River, about ten miles from Brandon. By this means about 800 horse-power can be developed and this can be increased later. Dynamos are to be put in next spring, when both power and light will be furnished.

Shipment was made recently of the largest motor that has yet been built in Canada. The motor was consigned to the British America Corporation of Rossland, B. C., and the shipment was made by the Royal Electric Company of Montreal. The motor is an S. K. C. two-phase machine, and its capacity is over 1,000 hp., and is to be used to drive the compressors and hoists at the mines. The total weight of the motor, boxed and ready for shipment, was 105,000 pounds, or 52½ tons. The weight complete of the motor with its accessories was over 120,000 pounds, or 60 tons, requiring two full cars to transport it across the continent.

The Nickel Copper Company of Ontario, whose large refining works are at the city of Hamilton, Ont., has begun operations on a large scale, and has placed in its new power house two 240 kw. and one 75 kw. S. K. C. generators; the former to drive the dynamos for the electrolytic process and the latter to drive the ore process. These three machines are being used as synchronous motors, taking the current from the Cataract Power Company's lines at 2,400 volts.

The city of Ottawa, at the last civic elections, voted largely in favor of municipal ownership and operation of an electric light plant. The special committee, appointed by the city council to report upon the feasibility of purchasing a municipal electric plant from the Ottawa Electric Company, has advised that no action be taken at present because of the terms which that company demands. The committee reports that the company does not want to sell its entire plant, but is willing to sell its street lighting plant, on condition that the city agrees to buy the power from the company for a period of ten years. The city, the citizens think, should not enter into a contract to take power for such a length of time. It is recommended that the city apply to the Ontario Legislature for such an amendment to the existing laws as will enable the city to arbitrate in its efforts to get a civic lighting plant, it being now debarred by the statute from so doing when a contract, as in the present instance, is still in force between a municipality and an electric company.

Meeting of the New York Electrical Society.

The 210th meeting of the New York Electrical Society was held at the College of the City of New York on the evening of December 12. Dr. Samuel Sheldon lectured on "Electrical Measurements of Precision." In the course of his talk Dr. Sheldon stated that commercial measurements are made with only such a degree of accuracy as is required by commercial conditions, while every possible refinement is employed in the making of measurements of precision. He added that the best of modern standard resistances are now made of manganin, which besides having a very small temperature coefficient gives very small thermal EMF.'s in combination with copper. Nearly all the alloys of nickel and iron have small temperature coefficients, but give a large thermal EMF. with copper.

After Dr. Sheldon's lecture, President Martin exhibited some 40 or 50 slides, chiefly night views, illustrative of lighting effects of the Paris Exposition.

The following resolutions were unanimously adopted:

Whereas, It is proposed to establish a national standardizing bureau; and

Whereas, Such a bureau would be of the greatest value and benefit to electrical science and industry in the United States, and assist in the further development of export electrical trade; be it

Resolved, That the New York Electrical Society expresses its approval of the legislation in furtherance of such an object, and

Resolved, That the Society associate itself with kindred bodies to secure the establishment of the bureau.

The following gentlemen were elected to membership in the Society: Edwin Rust Douglas, Ampere, N. J.; Rumsay N. Scott, 143 Liberty street, New York.

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LEGAL NOTE.

A receiver has been appointed for the Grand Island (Neb.) Electric Light, Ice and Cold Storage Company, which was organized in December, 1898, with a capital stock of $75,000.

PERSONAL MENTION.

Mr. Rollo Jermyn of Oswego, N. Y., was recently appointed financial manager of the Syracuse Telephone Company.

Mr. Robert T. Tighe, the first man to establish telegraph lines in South America under Adrian C. Morse, died at his home in this city last week.

Mr. Charles P. Bowditch was recently elected a director of the American Bell Telephone Company and of the American Telephone & Telegraph Company.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended December 5:

Antwerp, 27 packages, $1,681; Argentine Republic, 207 cases, $8,530; Australia, 8 cases, $410; Brazil, 90 cases, $6,281; Bristol, 4 cases, $500; British Guiana, 55 packages, $1,444; British West Indies, 2 packages, $160; Central America, 34 cases, $953; Chili, 24 packages, $616; Copenhagen, 1 case, $115; Cuba, 430 packages electric railing material, $10,980; 64 packages, $5,390; Danish West Indies, 5 packages, $52; Ecuador, 7 cases, $257; Havre, 225 packages, $20,153; 6 packages motor material, $643; Leeds, 10 packages, $120; Liverpool, 63 packages, $6,622; London, 162 cases, $5,520; 209 packages, $31,978; Newfoundland, 25 packages, $277; Nova Scotia, 11 packages, $149; 3 boxes, $125; Peru, 8 packages, $167; 26 cases, $1,160; Porto Rico, 18 cases, $228; 1 package, $26; Santo Domingo, 118 cases, $2,589; Southampton, 16 cases, $1,815; Trieste, 1 case, $90; Venezuela, 33 cases, $176.

The following are the exports of electrical material, from the port of New York, for the week ended December 13:

Antwerp, 26 cases, $4,000: Argentine Republic, 87 packages, $3,534; 8 cases, $1,819; Australia, 62 packages, $8,749; 2 cases, $126; Barcelona, 2 cases, $63; Berwick, 4 cases, $288; Brazil, 27 packages, $1,303; 9 packages electrical railroad material, $1,091: Bremen, 1 case, $352; British East Indies, 26 cases, $5,203, 6,479 packages electrical railroad material, $118,500; British Possessions in Africa, 81 packages, $8,266; British West Indies, 701 packages, $1,382; Central America, 194 packages, $796; Christiania, 34 packages, $4,622; Cuba, 197 cases, $7,938: 1 elevator, $290; Dundee, 10 boxes, $950; Ecuador, 25 packages, $1,009; Elberfeld, 1 package, $3; Frankfort, 4 packages, $300; Genoa, 276 packages, $25,726; Glasgow, 77 packages, $2,452; 51 reels electric cable, $21,507; Hamburg, 87 packages, $5,795; Havre, 23 packages, $929; Hull, 60 packages, $17,824; Huddersfield, 2 cases, $92: Liverpool, 328 packages, $27,893; London 118 packages, 1,633; 9 cases, $1,696; Manchester, 275 packages, $37,815; 1 case, $389; Mexico, 270 packages, $2,772; 15 cases, $525; Milan 17 packages, $1,910; Newcastle, 34 packages, $5,695; 36 cases, $3,500; Odessa, 1 package, $14; Peru, 4 packages, $105; Porto Rico, 92 packages, $2,166; Preston, 2 cases, $41; Rome, 1 case, $17; Southampton, 4 cases, $195: St. Petersburg, 8 cases, $1,584: U. S. Colombia, 7 cases, $202; Venezuela, 10 packages, $149.

INCORPORATIONS.

The National Manufacturing & Electric Company, Assumption, Ill.—to manufacture electric light, steam heat, brick and tile. Capital stock, $25,000. Incorporators: C. C. Corzine, A. Cazalet and I. H. Cushing.

The Merchants' Electric Company, New Orleans, La.—to establish electric light, heat and power plants. Capital stock, $100,00. C. D. Crandall president.

The United Light & Power Company, New York City—to furnish electric light, power and gas. Capital stock, $1,500,000.

The Empire City Gas & Electric Company, Trenton, N. J. Capital stock, $500,000. Incorporators: George W. Lynch, Martin Callesch and John T. Underhill, all of Jersey City.

The G. R. Gray Company, New York City—to do an electric equipment business. Capital stock, $5,000, Directors: G. R. Gray of Jersey City, F. H. Shepperd and Pauline V. Shepperd of New York City.

The Barrington Electric Light & Power Company, Barrington, Ill.—to furnish electricity for light, heat and power. Capital stock, $25,000. Incorporators: Frank Robertson, Avery R. Hayes and W. R. Clasen,

The City Power Company, Jasper, Fla.—to do any business in which electricity or water may be an important factor. Capital stock, $20,000. Incorporators: W. H. Greene, M. F. Horne, C. W. Smith and B. E. Leonard.

The Fort Wayne, Dayton & Cincinnati Traction Railroad Company, Dayton, O.—to build an electric railroad. Capital stock, $20,000. Incorporators: S. F. George, A. J. Miller, C. W. Gebhart, D. W. Sinks, W. Hobbit, C. E. Swayne, C. A. Lucius, D. S. Waymire and E. J. Monnstephes.

The Long Island Electric, Gas & Water Company, Trenton, N. J. Capital stock, $500,000. Incorporators: G. H. B. Martin, F. R. Hansell and Max Phillips, all of Camden.

The Modern Machinery & Electrical Company, Denver, Col.—to manufacture and sell electrical machinery. Capital stock, $25,000. Incorporators: H. C. Russell, A. V. S. Saunders and E. S. McKinley, all of Denver.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED DECEMBER 11, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

663,519. Electric Rail-Brake. Rudolf W. M. Schiemann, Dresden, Germany. Filed May 22, 1899.

663,600. Electric Railway. Theophilus P. Chandler, Philadelphia, Pa. Filed Oct. 22, 1900.

663,625. System of Electric Traction. Marco T. de Felice, Rome, Italy. Filed June 9, 1900.

663,700. Overhead Trolley System. Charles L. Leiby, Knoxville, Tenn., assignor, by direct and mesne assignments, to the Leiby Company, same place. Filed Dec. 5, 1898. Renewed Oct. 18, 1900.

663,740. Trolley for Electric Cars, William H. Earl, Painesville, O. Filed Aug. 14, 1900.

663,788. Trolley-Pole. William Schroeter and August Kautzmann, Dallas, Tex. Filed June 11, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

663,420. Arc-Light Hanger, George Cutter, Chicago, Ill., assignor to the George Cutter Company, same place. Filed March 10, 1900.

663,454. Electric-Arc Lamp. Frederick W. Martin and Frank Stewart, Hamilton, Canada, assignors of one-half to Brown, Boggs & Co., same place. Filed May 12, 1900.

663,467. Process of Producing Electric-Arc Lights, Ewald Rasch, Nuremberg, Germany. Filed May 7, 1900.

663,524. Incandescent Lamp. Samuel D. Washburn, Boston, and Clarence H. Tinkham, Cambridge, Mass.; said Tinkham assignor to Fred F. Rhodes, Boston, Mass. Filed March 12, 1900.

663,582. Flexible Supporting Structure for Electric Lamps, William F. Brewster, New York City. Filed June 12, 1900.

663,698, Electric-Arc Lamp. Josef H. Hallberg, Peabody, Mass., assignor to the Standard Thermometer & Electric Company, same place. Filed July 16, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

663,491. Controller for Electric Motors. Charles A. Dresser, Chicago, Ill., assignor to G. A. Edward Kohler and Franklin W. Kohler, same place. Filed May 10, 1900.

663,496. Electric Switch. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 11, 1899.

663,528. Electrically-Operated Clip for Tentering-Machines. William Whiteley and William Whiteley, Jr., Huddersfield, Eng. Filed July 27, 1900.

663,609. Dynamo or Motor. George L. Martin, New York City. Filed Aug. 24, 1900.

663,612. Circuit-Changer. Eustace Oxley, Lynn, Mass., assinor to the General Electric Company of New York. Filed May 29, 1899.

663,695. Electrical Interrupter. James M. Davidson, London, Eng. Filed June 7, 1900,

663,781. Circuit-Breaker. George W. Parsons, La Grange, Ill. Filed April 6, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

663,412. Telephone System. William W. Bennett, Mesquite, Tex. Filed Feb. 2, 1900.

663,510. Telephone-Switchboard. William S. Paca, Erie, Pa., assignor of one-half to Peter H. Adams, same place. Filed Feb. 16, 1900.

663,783. Selective-Signal System. Frank A. Pickernell, Newark, N. J., assignor to the American Telephone & Telegraph Company of New York. Filed Aug. 14, 1900.

MISCELLANEOUS.

663,460. Telegraph-Repeater. Charles D. Olsen and Thomas W. Carroll, Denver, Col. Filed Aug. 17, 1899.

663,461. Maximum-Demand Meter. Eustace Oxley, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 31, 1899.

663,489. Electrical Connection. William B. Cleveland, Cleveland, O. Filed Feb. 7, 1900.

663,490. Method of Forming Electrical Connections. William B. Cleveland, Cleveland, O. Filed July 12, 1900.

663,605. Wire-Coupling. William Frankham, Canton, O. Filed May 24, 1900.

663,643. Sparking Igniter for Explosion-Engines. Frederick R. Simms, London, Eng., and Robert Bosch, Stuttgart, Germany. Filed Sept. 12, 1898.

663,653. Electric Igniter for Gas-Engines. Walter H. Cotton, Chicago, Ill. Filed Nov. 23, 1898.

663,659. System of Electrical Distribution. Henry R. Keat, New York City, assignor to the Westinghouse Machine Company of Pennsylvania. Filed May 1, 1900.

663,719. Electrolytic Apparatus. Hermann Becker, Paris, France. Filed June 26, 1899.

663,729. Sparking Igniter for Explosive-Engines. Louis S. Clarke and James G. Heaslet, Ardmore, Pa., assignors to the Autocar Company, same place and Pittsburg. Pa. Filed Aug. 30, 1900.

663,750. Electric Contact or Current-Taking Device. Ernest Greil and Emile Audiger, Paris, France, assignors to the Electric Lighting Boards, Limited, London, Eng. Filed Jan. 10, 1900.

663,760. Magnetic Ore-Separator. August Johnson, Moline, Ill., assignor to the Barnard & Leas Manufacturing Company, same place. Filed Feb. 2, 1900.

663,764. Magnetic Separator. Emil Kreuser and Hugo E. Langguth, Mechernich, Germany, assignors to Mechernicher Bergwerks-Actien-Vereis, same place. Filed June 11, 1900.

663,767. Fire-Alarm. Reason C. Livingston, Spring Valley, Minn. Filed March 24, 1900.

COMMERCIAL PARAGRAPH.

J. J. Reidy & Co., 311-331 East street, New Haven, Conn., makers of the Donnelly Improved Steel Climbers, are the only firm that make a business of manufacturing climbers exclusively. They report that more of these climbers have been sold in the Eastern and Southern States in 1900 than all other makes combined, and also say that the climbers are "not an experiment, but the result of 15 years of practical experience." In order to give linemen an opportunity of examining the climbers, and as a matter of business, as one pair will sell a good many and create a demand for them among the wholesale trade, as was the case in New York City and Richmond Va., the firm makes the following offer If you will send them $1.50 they will send you one sample pair only, any size you state, of Donnelly's Improved Steel Climbers, express charges paid by the firm. The fact that the Western Union Telegraph Company of New York City buy these climbers in lots of 100 pairs of a size at a time is practical proof of the excellent quality of them. The following are a few of the well-known firms who buy Donnelly's Improved Steel Climbers: Western Union Telegraph Co., Postal Telegraph-Cable Co., J. H. Bunnell & Co., E. J. Brooks & Co., the J. Jones & Son Co., Manhattan Electrical Supply Co., Manufacturers & Inventors' Electric Co., Western Electric Co., Patterson Bros., Stanley & Patterson, of New York City; New York and Pennsylvania Telegraph & Telephone Co., Elmira, N. Y.; Wallbridge & Co., Buffalo, N. Y.; Roe & Conover, Newark, N. J.; Doubleday-Hill Electric Co., Pittsburg, Pa.; McIntosh-Huntington Co., Cleveland, O.; Erner & Hopkins, Columbus, O.; Morley Bros., Saginaw, Mich.; National Electrical Supply Co., Washington, D. C.; James McGraw, Tower-Binford Electric & Mfg. Co., Watkins-Cottrell Co., Richmond Hardware Co., Richmond, Va.; Edward Lovell's Sons, Savannah, Ga.; Carter & Gillespie Electric Co., Atlanta, Ga.; A. Baldwin & Co., New Orleans, La.; Electric Gas Lighting Co., Pettingell-Andrews Co., Boston, Mass.; Belcher & Loomis Hardware Co., Providence, R. I.; Congdon & Carpenter Co., Bridgeport, Conn.; L. L. Ensworth & Co., Hartford, Conn.; N. T. Bushnell & Co., C. S. Mersick & Co., New Haven, Conn.

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THE TELEPHONE WORLD.

Telephones for Rural Districts of Wisconsin.

The Farmers' Telephone Construction Company has commenced work in the township of East Troy in Walworth County, Wisconsin, and there the first system of its rural telephone service will be installed. Twenty-five subscribers have already been obtained in the village of East Troy, and it is reported that the farmers are taking up the scheme in a satisfactory manner. It was the original intention of the company to commence in the adjoining township of Spring-Prairie, but as the lines of the Wisconsin Telephone Company do not pass through that township it was concluded to begin in East Troy, where several long-distance lines meet in the village. The telephones which are to be put in are to be of the standard of the Wisconsin Telephone Company, with metallic circuits, and the service is promised to be first class in every respect. Under a new law passed by the last Legislature townships are permitted to issue bonds for the purpose of constructing telephone systems. East Troy township is now being asked to issue such bonds, to be delivered to this company upon the completion of the lines. The telephones are to cost $12 a year, and not more than four subscribers are to be placed upon one line. In the western part of that State a corporation of farmers operates a telephone system, but the yearly rental is $18. The East Troy system is to be connected with the long-distance lines of the Wisconsin Telephone Company, so that the farmers can talk with Milwaukee, Madison, Chicago or New York if they please. George N. Wiswell is president of the construction company, E. A. Wadhams is vice-president and Henry G. Goll is secretary and treasurer. The construction company expects considerable support in East Troy township from the summer resort people who are annually located along Lake Beulah and Crooked Lake, both of which are in that township. The company will take up other townships subsequently.

The Delaware & Atlantic Telegraph & Telephone Company, which is now controlled by the Bell Telephone Company, has decided to make a radical change in its system in Chester, Pa., by running its wires beneath the surface of the earth, where the lines will be protected from the terrific lightning storms of summer, the hail and sleet of winter, and the strong winds of March, comprising a trio of drawbacks with which the company has always had to contend. Conduits will be constructed along the main streets. In each square a pole will be erected for the distribution of the wires to the business places and residences of the company's subscribers. From the conduit to the top of each pole the wires will run in a cable. This system will have many advantages over the one now in vogue. The danger of falling wires will be averted and the number of unsightly poles lessened to one-third the number now in use. The company's engineer is now in Chester preparing plans and specifications for the route of the conduits. Considerable time will be required in making these preliminary arrangements, as efforts will be made to extend the underground circuit over the most propitious section of that city.

Articles of incorporation were lately granted to the Interstate Electrical Wire Subway Company of Kansas City, Mo., with a capital stock of $200,000. The incorporators are: W. S. Woods, William Huttig, J. J. Helm, W. A. Rule, W. W. Sylvester, H. C. Arnold and H. C. Ward. The company is the successor of the Kansas City Wire Subway Company, which had a capital stock of $20,000. It will continue the work of putting in a system of conduits for underground wire service begun by the old company. The stockholders will also organize an electric lighting company and contemplates forming an independent telephone company. Both of these companies will be distinct from the Subway Company, but will lease its conduits for conducting their wires.

The Independent Union Telephone Company of Buffalo, N. Y., was recently incorporated to maintain telephone lines between Buffalo, Rochester, Syracuse, Utica, Albany, Troy, and the cities towns and villages in the vicinity of cities named, in Central and Western New York. The company has a capital of $200,000, and the directors are Samuel B. Rawson, Irving H. Griswold, of Elyria, O.; George H. Frost, of Buffalo, and A. R. Smith of North Tonawanda.

The city council of Sherman, Tex., has granted a franchise to Frank B. McElroy and associates to operate a system of telephones in that city.

The aldermen of Batavia, N. Y., have granted a franchise to the Rawson Electric Company to install a telephone system in that city.

A telephone line is being put in from Macon to Milledgeville, Ga., with stations at Clinton, Gray and Haddock of that State.

Mountain Telephone System in California.

Forest Commissioner W. H. Border of Los Angeles, Cal., recently sent a force of rangers, under the superintendence of L. Newcomb, to begin construction on the telephone system to be put in operation between Sturdevant's camp across to the west fork of the San Gabriel River, a distance of fifteen miles. This system is to be used by the rangers and is expected to prove of great value in the fighting of future fires. It will be put up as fast as possible, although the severe damage done the recently-constructed mountain trails will cause considerable delay, both in this matter and in the projected purpose of planting tree seed on the reservation. The rangers' time will necessarily be employed during most of the winter months in repairing the trails.

Many complaints are being made of the inefficient telephone service furnished to patrons through the 38th street exchange of the local system in this city. Although the telephone service here frequently has become so unsatisfactory as to cause complaint patrons declare that never before were complaints so justified as those now being made against the exchange in West 38th street. It has been possible formerly to obtain some redress through appeals to the manager of the exchange, but even this recourse has ceased to bring about the desired results. One explanation offered for the inefficient service is that the exchange in West 38th street has been converted into a kindergarten for young persons who are striving to become telephone operators. No explanation is given, however, as to why one of the principal exchanges of the city should be selected for this kindergarten work. Nor is it known why the young operators after they have gained some knowledge of the work should be replaced forthwith by others who desire to learn. This is the company's secret and it is one which the exchange manager, following an established rule for reticence, is believed to take especial pride in not revealing to patrons who merely pay exorbitantly for a service which they are unable to get.

A direct independent telephone line will be constructed from Warsaw to Indianapolis, Ind., by Strauss Brothers, the principal stockholders of the Commercial Telephone Company of Warsaw, a new organization which recently purchased the property and business of the Warsaw Telephone Company, whose toll lines are already in connection with fifty cities, towns and villages in the counties of Kosciusko, Elkhart, Whitley, Marshall, Fulton and Noble, in Northern Indiana. The construction of a direct line to Indianapolis, will throw the Commercial Company into competition with the Central Union Company. Work on the new independent line will begin at once.

It was announced last week in Austin, Tex., that the national advisory board of the Electrical Workers' Union will order a strike of all the members of the order in the employ of the Erie Telephone system in sympathy for the strike of the employes of the Southwestern Telegraph & Telephone Company in Texas, which is a part of the Erie system. The strike in Texas was begun several weeks ago, and the places of all those who walked out have been filled by non-union workmen.

The local independent telephone lines in Mahoning County, O., are being widely extended. The new line from Poland to Calla is nearing completion. The United States Telephone Company has already commenced stringing wires to the State line. The line will be built out South avenue to the Boardman road running past Poland to Petersburg and on through Columbiana to the State line. It is expected to be in operation by January 1.

The Woonsocket & Wessington Springs, S. D., telephone system, about fifty miles of line, with four stations, was sold to the Dakota Central Company recently. The latter has just completed that line to Huron, giving Woonsocket direct communication with all stations in the northern part of the State. The line will now be extended to Letcher and Mitchell.

An independent company, the Farmers' Union, is being organized to construct and operate an independent telephone line between the villages of Jasper and Hedgesville, N. Y.

News from Montreal, Quebec, states that the stockholders of the Bell Telephone Company recently authorized the directors to issue $2,500,000 debenture bonds.

The Cumberland Telephone & Telegraph Company has lately put in an exchange at Adams, Tenn.

It is stated that a telephone connection with Sarasota Fla., is soon to be made.

A brisk telephone war is being waged in Lexington, Ky., between the Cumberland and the Fayette Companies. The Fayette Company is busy erecting poles all over the city. Eleven carloads of poles, two of wire and one of cross arms for the poles have been received. Ten thousand feet of new cable will be strung at once. A force of men is working, and the new exchange will probably be in operation shortly. The Cumberland Company in anticipation of the opposition has reduced its residence rate to $12 a year, and says that it will double the list of its subscribers.

The New England Telephone & Telegraph Company has decided to try an experiment in Gloucester, Mass. It will install telephones in the residences on free trial from now until the first day of April, 1901, as soon as the instruments can be installed. Each station will be equipped with a long-distance instrument and metallic circuit to enable the subscriber to call any out-of town party should they desire to do so. Free service however covers local calls only. The company's object in doing this is to introduce the telephone into the residences more extensively.

The directors of the Iowa Telephone Company, recently consolidated with the Central Union, met at Davenport, Ia., a short time ago, and decided to submit to the stockholders a proposition to increase its capital stock from $1,000,000 to $4,000,000. The money raised from the issue will be used in putting the wires underground and improving the service in many Iowa cities.

Telephone communication has been established beeween Huron and Woonsocket, S. D., completing a system connecting Huron with cities in every direction. The local plant has been greatly improved and now Huron boasts of being one of the best equipped cities for telephone communication in the Northwest.

The cable of the Sunset Telegraph & Telephone Company, containing practically all the long-distance lines out of Los Angeles, Cal., was maliciously severed with an axe a short time ago, entirely interrupting telephone connection with San Francisco and all points north and east. The police and fire alarm wires were cut at the same point.

Forty up-to-date telephones have lately been put in use at the Jackson Sanitarium at Dansville, N.Y., and a new switchboard is now being installed.

The Mutual Telephone Company of Creston, Ia., is about to have its lines in operation and a lively war is expected between it and the Iowa.

Inspector Grant of the Southwestern Telegraph & Telephone Company has lately been making a general inspection of all the exchanges of his company in Texas.

V. O. Hayden and M. H. Wade, who are installing the independent telephone system at Akron, N. Y., state that they have nearly 200 subscribers.

Arcade, N. Y., and Franklinville, N. Y., will be connected in the spring with Akron and Cuba, N. Y. All "Williams" instruments have been used in the above four plants.

The New England Telephone & Telegraph Company has acquired control of the Deer Island Telephone Company of Maine.

Foley, Ore., is now connected with a long-distance telephone.

TELEPHONE INCORPORATIONS.

The Reynolds County Telephone Company, Centerville, Mo. Capital stock, $1,000. Incorporators: J. J. Jamison, S. F. Cross, K. Z. Carter and others.

The Chagrin Falls Telephone Company, Chagrin Falls, O.; —to construct and operate telephone lines. Capital stock, $15,000. Incorporators: C. H. Hubbell, F. P. Shumaker, W. D. Brewster, J. W. Huchinson and L. Hubbell.

The Freeport Home Telephone Company, Freeport, O. Capital stock, $5,000.

The Corsicana Telephone Company, Corsicana, Tex. Capital stock, $50,000. Incorporators: F. B. McElroy, of El Paso; Frank C. Smith, H. M. Aubrey, both of San Antonio; Harvey Meyers, U. J. Howard, both of Covington, Ky.

The Northwestern Telephone & Telegraph Company, Carthage, N. Y.—to construct and operate telephone, telegraph, electric light and power plants. Capital stock, $2,00,000.

The Battle Creek Telephone Company, Battle Creek, Mich. —to do a general telephone business. Capital stock, $10,000. Incorporators: W. H. James, H. J. Snover, W. Warnock, L. Derr, H. C. Jordan, C. Wirth, all of Battle Creek.

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GENERAL ELECTRICAL NEWS.

Lighting.

Anderson, Ind.—The Union Traction Company is preparing to furnish illumination by electricity to the various towns along the lines of its interurban electric road from its central power station at this place.

Asheville, N. C.—A. Field contemplates the erection of an electric light plant here.

Athens, Ga.—This city, it is reported, is seriously considering the question of erecting its own electric light plant.

Cloverdale, Cal.—The citizens of this place are agitating the question of erecting an electric light plant.

Clyde, N. Y.—Charles A. Lux, the promoter and head of the new electric light company here has made a five years' contract with the village to furnish light for the streets and other public places at the same price now paid by the village to the Clyde Gas & Electric Company.

Creston, Ia.—Mayor Skinner has received a communication from D. B. Lyons at Des Moines stating that when the council was ready he was prepared to make it a gas and electric light proposition.

Fayetteville, N. C.—This city will issue bonds for the erection of a municipal electric light plant.

Cullom, Ill.—This place will soon have an electric light plant.

Covington, Ky.—It has been decided to vote to issue $75,000 of bonds for the erection of a municipal electric light plant. W. E. Gunn, engineer.

Danville, Ill.—A movement is on foot to start a new electric light company here. Some of the former members of the Danville Telephone Company are connected with the new enterprise.

Gaffney, S. C.—This city will expend $11,000 in improving its electric light plant.

Humboldt, Tenn.—The B. C. Jarrell Company of this city will shortly erect a complete electric lighting plant here.

Johnstown, N. Y.—A new electric light company is being organized here.

Laurel, Miss.—The Laurel Light & Power Company has been chartered for the erection of an electric light plant.

Lincoln, Ill.—The city council has received a proposition from R. Wolfsberg to build and equip a municipal electric light plant.

Litchfield, Ill.—Bids will be received by this city until December 31 for supplying 60 or more 2,000 cp. open arc electric lights for street lighting; bidders are also requested to submit propositions for erection of an electric light plant of 100 lights capacity as above with 60 or more lights. Address H. Hall, city clerk.

Milford, Conn.—In all probability an electric light plant will be established here. George M. Gunn is supposed to be back of the movement.

Napanock, N. Y.—The reformatory here will be lighted by 1,500 electric lights.

Pawtucket, R. I.—An issue of $100,000 electric light bonds is contemplated by this city.

Pomeroy, Wash.—This city has a project for an electric light plant.

Portsmouth, N. H.—The entire plant of the Portsmouth Gas, Electric Light & Power Company has been sold to W. D. Lovell. The exchange means the expenditure of about $350,000 in improvements and alterations of the plant in this city.

Roseburg, Ore.—L. A. Walker has asked for an electric light franchise here.

Springfield, Mass.—The mayor will petition the State gas and electric light commissioners to investigate conditions in Springfield, with a view to ordering a reduction in the rates charged for electricity for lighting and power.

Thomaston, Ga.—This city will soon hold an election to decide the issuance of $10,000 in bonds for an electric light plant.

Thomasville, Ga.—The Thomasville electric light plant was sold lately at receiver's sale to Mr. Robert Gamble, who paid $15,800 for it.

Troy, Mo.—"Tink" Stocking, who gave Troy the telephone, proposes to install an electric light plant.

Valley Falls, N. Y.—It is stated that A. E. and N. B. Powers, who recently purchased the Lake knitting mill property in this place, intend to establish an electric plant for the purpose of furnishing light for the villages of Schaghticoke, Valley Falls and Johnsonville.

Wilmington, Del.—The New York capitalists who have secured a controlling interest in the Universal Conduit, Light, Heat & Power Company of this city will shortly begin laying conduits, and erecting an electric light plant here.

Street Railways.

Albany, N. Y.—The Albany & Hudson Electric Railway will be extended to Poughkeepsie. H. A. Benedict, superintendent, Hudson, N. Y.

Atlantic City, N. J.—Real estate owners and residents in the southern section of the city are petitioning the West Jersey & Seashore Railway Company to put in a trolley loop at Ventnor.

Bayville, N. Y.—There is some talk of a trolley line from here to Locust Valley.

Birdsboro, Pa.—Surveyors for the Reading Traction Company have been surveying a trolley line from Reading to this place. The road may extend to Pottstown, returning to Reading by way of Boyertown.

Cleveland, O.—The Cleveland Western Reserve and American Trust Companies of this city have purchased the Elgin, Carpenterville & Aurora Electric Railway near Chicago for $550,000. Another suburban railway is to be built near Chicago by Cleveland capitalists, many of whom are interested in the trust companies.

Columbus, O.—A company has been incorporated under the laws of New Jersey to build a line from Delaware to Magnetic Springs and other lines leading to Richwood and Marysville. The capital stock of the company is $400,000, and T. N. Kerr of this city is interested.

Decatur, Ind.—A. L. Scott, president of the Ft. Wayne Traction Company, J. W. Tyndall, and H. M. Romberg of this city, and W. H. Harkins of Portland, have made application to the city council for a franchise for an electric line. It is the intention to build the road from Ft. Wayne to Richmond.

Elwyn, Pa.—The officers of the Media, Middletown, Chester & Aston Trolley Company have practically secured the right of way over the entire route to this place.

Everett, Wash.—A franchise to furnish electric light and power and to build and operate electric street railway lines was granted to Ed. P. Burch of Minneapolis at a recent council meeting held here.

Findlay, O.—The Lima & Findlay Electric Railway Company has lately been incorporated with $20,000 capital stock to build an electric railway between Lima and this place. T. D. Roff, J. D. S. Neeley and L. Koch are interested.

Ft. Wayne, Ind.—An electric line is to be constructed from this city to Huntington.

Milford, Del.—Milford business men are discussing a project to run a trolley line from this place to Ellendale.

Newark, N. Y.—The consent of the railroad commissioners of the State of New York has been obtained to the construction of the Newark & Marion Electric Railway and by the first of the year the contracts for it will probably be let. The road will be ten miles long and it will cost about $150,000.

Painesville, O.—B. P. Foster of Cleveland, associated with other Cleveland capitalists, has applied for a franchise for an electric railroad between here and Fairport Harbor, 3 miles north.

Plainwell, Mich.—At a special meeting of the village board a franchise was granted the Kalamazoo Traction Company to build an electric road through this village.

Ridgeway, Ont.—A route for the proposed trolley line that will connect Fort Erie Grove with Crystal Beach and this village is being surveyed. Capital to build the road is assured and it will be rushed to completion.

Santa Ana, Cal.—The board of supervisors is preparing to advertise for bids for the electric street franchise for a proposed street railway from this city to Los Angeles via Anaheim, Fullerton and Whittier.

Versailles, Ind.—The residents of Ripley County are making an effort to have an electric or steam railway built between Greensburg and this city.

York, Me.—Wm. W. Nason, Ephraim Dyer, Frank M. Higgins, William R. Anthoine, Charles G. Moulton and Samuel O. Clark are interested in the York County Electric Railroad Company, formed for the purpose of building and operating a street railway 11 miles long in this county.

Manufacturing.

Libertyville, Ill.—The Freeman Power Supply Company, with a capital of $20,000, has been organized lately for the purpose of manufacturing and selling electrical and mechanical power. Ernest Freeman, M. M. Harms and Theodore K. Jackson have an interest in the company.

New York City.—The F. A. La Roche Company of this city was lately formed for the purpose of manufacturing electrical appliances, with a capital stock of $100,000. G. M. McWilliam, J. W. Avery and P. K. Stern are among those interested in the concern.—R. L. Steiner, Albert Lenz and Matilda Steiner are interested in the recently formed R. Louis Steiner Manufacturing Company of this city, which will manufacture gas and electrical fixtures with a capital of $15,000.

Company Matters.

Camden, N. J.—The following directors were reelected at the annual meeting of the Fairmount Park Trolley Transportation Company held last week in this city: Charles A. Porter, Robert H. Foerderer, Frederick S. Dickson, Dr. L. H. Filbert, Bernard Corr, Samuel C. De Coursey and John B. Peddie. The report of President Porter stated that this year's earnings compare favorably with the showing for 1899.

Chicago, Ill.—The Sanden Electric Company of this city has lately dissolved.

Reading, Pa.—William Jones and C. W. Lytton have formed a business partnership, known as the Reading Electrical Company. They will deal in electrical supplies and propose to ultimately form a stock company.

Rochester, N. Y.—At the recent annual meeting of the Standard Electric Construction Company the following directors were elected for the ensuing year: Birton A. Vandy, Arthur L. W. Miller and Walter H. Tobey.

Power and Transmission.

East Killingly, Conn.—New York capitalists have been looking over the old Young's mills property here with a view to securing an option on it for purchase in case the Providence and Danielson electric road is built.

Lockport, N. Y.—The Vanderbilt interests, through the agency of the Niagara, Lockport & Ontario Power Company, will build a power plant, rivaling in extent the Niagara Falls plant. They will cut a wide power canal from Niagara River to this city, also build a power transmission line to Depew, and make of Lockport and Depew electric cities.

Automobiles.

Ilion, N. Y.—It is stated that the Remington Automobile Company is making arrangements to permanently locate here where the enterprise originated.

Milwaukee, Wis.—The Milwaukee Automobile Company, of which W. H. Starkweather is president, is preparing to make shipments of its product to St. Petersburg, Russia, and London, Eng.

Sea Cliff, N. Y—This place is to have an automobile service next summer.

Toledo, O.—This city has an opportunity to try to secure an automobile plant employing 5,000 men.

Wilkes-Barre, Pa.—New electric busses were placed in regular service in this city a short time ago.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Dec 17						
United Traction	100	$5,000,000	$5 000,000	½ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Dec 17						
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	....	—	15
Bridgeport, Conn—Dec 17:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Dec 17:						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18⅛	18¾
Boston, Mass.—Dec 17						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co......pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	[illegible]	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	113
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156	157
Brooklyn N. Y.—Dec 17:						
Brooklyn City Ry	100	2,000,000	1,923,400	....	239	233
Brooklyn Rap. Transit Co., tr certif..	100	48,000,000	48,000,000	....	77½	78
c Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* d Brooklyn City RR.......guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	257	259
e Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	..	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad......pfd.	......	6,000,000	6,000,000	....	75	80
f Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	..	..
g Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	..	..
Buffalo N. Y.—Dec 17:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Dec 17						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	90	91
Charleston, S. C.—Dec 17						
Charleston City Ry. Co	50	100,000	100,000	3 % S.	..	..
Enterprise City RR. Co	25	1,000,000	250,000	....	..	..
Chicago, Ill.—Dec 17						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	255	260
Chicago & South Side R. T. RR	100	10,828,800	10,828,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9½	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	84	82½
Met. West Side El., pfd	100	15,000,000	9,000,000	....	84½	84¼
North Chicago Street RR	100	10,000,000	6,600,000	8 % Q., Jan.	209	210
h North Chicago City RR	100	500,000	249,900	....	197	200
South Chicago City Railway	100	2,000,000	1,603,200	....	99½	[illegible]
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	95	95½
Union Traction Ry..........com	....	1,250,000	624,900	85 %	10	10½
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	56	55
Cincinnati, Ohio.—Dec 17:						
Cincinnati Inc. Plane Ry......com.	50	1,000,000	575,000	....	..	..
Cincinnati Inc. Plane Ry......pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
i Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Dec 17:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Dec 17:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	..
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Dec 17:						
City Railway Co.............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co.............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $525,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Dec 17						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	—
Hartford & West Hartford RR	100	1,000,000	247,000	....	—	—
Holyoke Mass.—Dec 17						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Dec 17						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	—
Indianapolis, Ind—Dec 17.						
*Indianapolis Street Ry	....	5,000,000	5,000,000	....	27	29
Lancaster, Pa.—Dec 1						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	—	—
Lancaster & Col. Electric Ry	....	....	87,500	....	—	—
West End Street Railway	....	....	....	....	—	—
Louisville, Ky.—Dec 17:						
Louisville Ry.................com.	100	4,000,000	3,500,000	1¼ %., April.	82	83
Louisville Ry.................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Minneapolis, Minn.—Dec 17						
Twin City Rapid Transit.......com.	100	17,000,000	15,010.000	....	68⅝	69¼
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	136	137
Montreal, Canada.—Dec 17						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	271	273
Toronto Street Ry. Co.	100	6,000.000	6,000,000	1¾ % S., J. & J. †	107½	107¾
Memphis Tenn.—Dec 17:						
Memphis Street Railway Co	100	500,000	500,000	....	25	—
New Haven, Conn.—Dec 17:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	300,000	....	..	—
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Dec 17						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
a Crescent City RR..........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
b New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	—
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Dec 17:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
c Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	85
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q..Nov.	120	85
d Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900	173½	178¾
e Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
f Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
g Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
h Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
i 42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
j Ninth Avenue RR.........guar.	100	800,000	800,000	....	198	201
k Sixth Avenue RR..........guar	100	2,000,000	2,000,000	....	205	225
l Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	409	418
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	118	118½
m 42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Dec 17:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	59¾	60
North Jersey Railway Co	100	6,000,000	6,000,000	....	24½	25½
United Elec. Co. of New Jersey..	100	504,000	504,000	1⅝ % A.	23	24
Pittsburg, Pa.—Dec 17:						
Allegheny Traction Co	50	500,000	500,000	....	7	58
o Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	28½	29
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	64½	65
p Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	73
q Citizens' Traction Co	50	3,000,000	‡3.00	6 % A.	72½	72½
r Duquesne Traction Co	50	3,000,000	‡3,00	6 % A.	..	...
s Pittsburg Traction Co	50	2,500,000	1,90	8½ %, Nov.	⅛	—
Federal St. & Pleasant Valley Ry..	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co...	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000		5 % A., June	..	..
United Traction Co..........com.	50	17,000,000		J. & J.	15	15¾
United Traction Co..........pref	50	3,000,000		J. & J.	50½	51

*Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Dec 17						
Union Street Railway Co.	100	$850,000	$850,000	2 %, Feb.	160	165
Northampton, Mass.—Dec 17						
Northampton Street Ry.	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Dec 17:						
Omaha Street Ry.	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Dec 17.						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Dec 17:						
United Traction & Electric Co	100	8,000.000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Dec. 17						
Fairmount Park Trans. Co....$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount....	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	588,900	‡588,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	300,000	300,000	3 % Feb. 1, '99.	75	76
Union Traction Co.......... $12½ pd	50	30,000 000	29,980,450	....	36⅞	37
bElectric Traction Co.	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry.	50	500,000	†192,500	$8 share Q.	345	..
cFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry...	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry....	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
cPeople's Traction Co.	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry....	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co.	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
jCatherine & Bainbridge St.....	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry.....guar..	50	1,060,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry.....	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR..	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry....	50	750,000	‖420,000	$12 share, July '98.	3.8¾	309
jPhiladelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar...	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖335,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry....	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Dec 17						
Rochester Railway Co.	100	5,000,000	5,000,000	....	20	23
Reading, Pa.—Dec 17						
jReading Traction Co.	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry.	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry.	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis, Mo.—Dec 17						
Fourth Street & Arsenal Ry.	50	300,000	150,000	....	--	--
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry.	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co.	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds....	..	2,500,000	2,500,000	....	--	--
Citizens' RR.	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR.	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR.	50	2,400,000	2,800,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.............com.	50	500,000	500,000	....	19	20
United Electric Ry.........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	63	65
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	....	68	70
Union Depot RR.	100	4,000,000	4,000,000	3 % A., July, '99.	--	--
San Francisco, Cal.—Nov.						
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	375,000	$2.50 share, '96.	59	..
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61½	63⅛
Presidio & Ferries RR.	100	1,000,000	550,000	....	--	16
Scranton Pa—Dec 17:						
Scranton Railway Co.	50	6,000,000	2,500,000	....	29	30
m Scranton & Carbondale Trac. Co..	100	500,000	500,000	....	16½	...
m Scranton & Pittston Traction Co..	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Dec 17:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Dec 17						
Springfield Street Ry.	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Dec 17:						
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Dec 17.						
Toronto Street Ry.	100	6,000,000	6,000,000	1¾ % S.	§108¼	109
Montreal Street Railway Co.	.....	4,000,000	4,000,000	4 % S.	272¼	273
Washington, D. C.—Dec 17:						
Belt Ry. Co.	50	500,000	500,000	....	--	--
Capital Traction Co.	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co.	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry....	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry.....	50	200,000	200,000	....	29	21
Metropolitan RR. Co.	50	1,000,000	458,900	2½ % Q.	--	--
Worcester, Mass.—Dec 17						
*Worcester Traction Co.........com.	100	8,000,000	8,000,000	....	81¼	84
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry...	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Dec 17:						
Wilkesbarre & Wyoming Val. Trac..	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1896-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

Dividend of 6 % guaranteed by Reading Traction Company.

Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 17						
American Te & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	155	157
Erie Telegraph & Telephone Co....	100	......	......	1 % Q., Feb. 20,	100	101
New England Telephone Co.	..	10,394,600	10,304,600	$1.50 p. sh. Feb	127½	128
New York.—Dec 17:						
American Telegraph & Cable Co...	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co.....	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co.	100	10,000,000	10,000,000	1¾ % Q.	170	175
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co.	100	2,000,000	......		3	3⅛
*New York & New Jersey Tel. Co..	100	5,000,000	3,723,000	2½ % Q., Jan.,	165	170
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co...	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co.	..	......	97,370,000	1¼ %, Q, Jan. '99.	86	86⅛
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Dec 17.						
American Dist. Teleg. (Phila.).....	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co..	100	......	......	....	67	70
Chicago Telephone Co.	100	......	......	....	200	210
Central Dist Prtg & Telg.Co.(Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co.	50	......	......	....	96½	97
Southern New Eng. Teleph. Co.....	100	3,000,000	......	....	..	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 17						
Fort Wayne Electric trust receipts..	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	171¾	171⅞
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg.Co.com.	50	......	146,700	....	53½	54
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	64	65
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Dec 17						
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1½ % Oct., '98.	--	--
Edison Ore Milling Co.	100	......	......	....	8	12
Electric Vehicle Co..............com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	171¾	171⅞
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	....	41	..
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,0 00	A. & O.	110	126
Pittsburg, Pa—Dec 17						
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co.	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Dec 17						
Edison Electric Light Co.	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	80	85
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	88	91
Northern Elec. Light & Power Co..	10	550,000	550,000	......	18	18½
Southern Elec. Light & Power Co..	10	187,500	187,500	....	30	--
Miscellaneous.—Dec 17						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co.	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	......	....	175	176
Hartford (Conn.) Lt. & Power Co..	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98½	99
Rhode Island Elec. Protec. Co.	100	......	......	....	118½	120¼
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q	‡206¼	208
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1¾ % Q	133¼	35
Thomson-Houston Welding Co.	100	......	......	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.....	100	......	......	....	105	106

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Dec 17						
American Electric Heating Co.	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Dec 17:						
Consolidated Electric Storage Co...	...	......	....	....	8	12
Safety Car Heating & Lighting Co..	100	......	....	......	150	155
Worthington Pump Co.........com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co...........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Dec 17						
Electro Pneumatic Trans. Co	10	1,500,000	......	----	3	3½
United Gas Improvement Co..scrip.	50	10,000,000	......	----	..	162
Welsbach Commercial Co.....com.	100	8,500,000	......	----	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co.	5	525,100	......	....	48	43½
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Dec 17:						
Carborundum Mfg. Co.	100	200,000	200,000	....	--	..
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	209	210
Miscellaneous.—Dec 17:						
*Barney & Smith Car Co.......com.	100	......	1,000,000	----	18	16
*Barney & Smith Car Co........pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co.	25	......	....	....	82	..
Consol. Car Heating Co.	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co.	100	....	....	----	105	109
*Pratt & Whitney Co...........com.	100	......	....	----	2	4
*Pratt & Whitney Co............pfd	100	....	......	----	40	50
Stillwell-Bierce Co.............com.	..	....	....	----	..	50
Stillwell-Bierce Co..............pfd.	..	....	....	2 % Sept 1, '99.	50	65
Shultz Belting Co.	100	500,000	....	....	90	96
St. Charles Car Co	-	....	....	......	90	108

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Dec 17, 1900

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117⅛	....
†The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co..........1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102¾
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	......
†Baltimore Traction Co.......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104⅛	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121⅛
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104⅛	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....
†Charleston City Ry...........1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¾
‡Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T..............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‖So. Cov. & Cin. St. Ry........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Dec 17, 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114¼
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR..........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Dec 17 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry...............1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Dec 17. 1900.

Name	Amount Autherized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1913	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	[illegible]	500,000	1912	M & N	109	......
Winchester Avenue RR.....Deben. g. 5	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Dec 17, 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	*$150,000	1912	*M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105¾	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1948	J. & J.	......	.....
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co........Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	800,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Dec 17, 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface.............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	[illegible]
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	300,000	300,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	350,000	350,000	1919	....	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128½
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry...........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,085,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Dec 7. 1900

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry.....................1st mtg. 5s.	2,500,000	300,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Dec 17, 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	350,000	310,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	......	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	....	1948	......	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1908	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	----	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Dec 17 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co.................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	......	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	113
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	....
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co....................5s.	2,500,000	2,039,000	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	....

Providence R. I.

Date of Quotation—Dec 17, 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry.................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Dec 17, 1900.

Name	Amount Authorized.	Amount Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101½	102½
Citizens' Railway Co......1st mtg. 5s	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter.—1st	1 000 000	900 000	191	J & J	17	

*With interest. *Unlisted.

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation—Dec 17, 1900.						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	106
Lindell Ry. Co.........................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co...............Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	3,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bdr.						
San Francisco Cal.						
Date of Quotation—Nov 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000.000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co..................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co..............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250.000	250 000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Dec 17, 1900						
Belt Ry. Co.........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	......
Eckington & Soldiers' Home.1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†850,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Dec 17, 1900.						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons. m. 5s	4,000,000	8,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg. 5s.	8,000,000	2,866,000	1932	M. & N.	112	118
¶Columbus (O.) St. Ry......1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg. 5s	15,000,000	18,965,000	1933	J. & D.	111¼	111⅝
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg. g. 5s	2,000,000	572,000	1938	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.).Cons. mtg. 5s	8,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.......................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$900,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. St. RR. Co.						
‖$87,000 in treasury.						
§$980,000 res'ved to redeem prior liens.						
††$520,000 in escrow.						
					*With int'res	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass.						
Date of Quotation—Dec 17 1900						
Delaware Gas Lt. Co.,... ....1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	....		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation—Dec 17, 1900						
Allegheny County Light Co........ ......6s.	560,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co..Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Dec 17, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn)........	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. . ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s	8.000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 17, 1900.					100½	101
American Bell Telephone.................. 4s.			1908	F. & A.	......	....
NorthwesternTelegraph Co..................7s.	....	......	....	......	....	....
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 17, 1900.						
American Electric Heating .... 7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co.............	....	....	......	......	......	25
Barney & Smith Car Co.....................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co......................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The Peoria, Ill., Gas and Electric Company has increased its capital stock from $500,000 to $1,000,000.

Books of Philadelphia Electric 4 per cent. trust certificates closed December 15 and will reopen January 2 for interest.

There has been incorporated under the laws of New Jersey the American Street Railway, Generating & Power Company, with a capital of $2,500,000.

Advices from Cincinnati state that the property of the Suburban Electric Company of Covington has been bought under foreclosure by the bondholders for $181,000.

The Lowell, Mass., Electric Light Corporation reports as follows: October gross earnings, $16,030; net earnings, $5,527. Four months gross earnings, $56,306; net, $15,503.

The United Traction and Electric Company of Jersey City, N. J., has declared a dividend of 1 per cent., payable January 2. Books close December 19 and reopen January 3, 1901.

The Twin City Rapid Transit Company has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable January 2. Books close December 27 and reopen January 2.

The Milwaukee, Wis., Street Railway Company will increase its capital stock from $3,000,000 to $15,000,000 and will use the additional capital in general improvements and in building a new power house.

The Westinghouse Electric and Manufacturing Company has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable January 2. Books close December 20 and reopen January 3.

The Brooklyn Rapid Transit Company's annual report for the fiscal year ending June 30 shows: Gross receipts, $11,768,550; expenses, $7,106,373; net, $4,662,177; charges and taxes, $4,135,405; surplus, $526,772; total surplus, $623,426.

A. B. du Pont has been elected second vice-president of the St. Louis Transit Company of St. Louis, Mo., and will assume charge of its operating department on January 1. Mr. du Pont has been the general manager of the Detroit Citizens Street Railway and Detroit Electric Company for several years past.

The executive committee of the Nassau Electric Railroad Company of Brooklyn has recommended to the directors the payment of a dividend of 4 per cent. on the preferred stock, payable December 31. No dividend was ever before paid on this stock. This company was leased two years ago by the Brooklyn Rapid Transit Company.

A cablegram from London states that H. F. Parshall, an American engineer, will succeed D. H. Louderback, of Chicago, as constructing engineer of Charles M. Yerkes' new underground railway. It is believed that Howard Abel, president of the Northwestern Elevated Railroad of Chicago, will be president of the Yerkes line.

The Mexican Telephone Company reports for October: Gross earnings, $15,717, increased, $2,408; operating expenses, $7,854, increased, $968; net earnings, $7,863; increased, $1,440. From March 1 to October 31: Gross earnings, $122,197; increased, $19,336; operating expenses, $67,671; increased, $7,262; net earnings, $54,526, increased, $12,074.

A bill which the Chicago Street Railway Commission is to present to the city council, will include recommendations for the municipal ownership of street railways, this question to be decided by popular vote, the unification of all street railway systems in the city, arbitration of labor differences, and the publication of detailed financial statements by the railway companies.

The deal between the Canadian General Electric Company, of Toronto, Ont., and the Royal Electric Company of Montreal, Que., has been fully consummated, and from it the latter company will get upwards of $1,000,000, as the result of its disposal of its manufacturing plant. This means the establishment of an electrical manufacturing trust in Canada with a capital of $60,000,000.

The Metropolitan Street Railway Company of New York City has declared the regular quarterly dividend of 1¾ per cent., payable January 15. Books close December 26 and reopen January 16. The balance sheet for the quarter ending September 30 shows: Gross earnings, $3,445,369; net, $1,890,333; other income, $162,937: total, $2,053,270: fixed charges, $1,128,985; balance, $924.285.

The general balance sheet of the Kings County Electric Light and Power Company as of November 1, 1900, shows: Assets—Property and construction, $3,259,210; Central Trust Company, trustee, $1,000,000; stock in other companies, $5,175,770; bills receivable, $175,000; accounts receivable, $55,072; cash on hand, $22,084; total, $9,687,136. Liabilities—Capital stock, $1,980,000; first mortgage, 5 per cent. gold bonds, $2,500,000; purchase money 6 per cent. gold bonds, $5,175,900; accounts payable, $606; profit and loss surplus, $30,630; total, $9,687,136.

The following statement has been given out by the Massachusetts Electric Lighting Association: "In answer to inquiries as to the attitude to be assumed by the association towards the petitions of several large street railway companies recently published, which, upon their face, seem to look towards a possible entry into the field of electric lighting or power by those companies, we are pleasd to be able to say that we have received the most positive assurances from those in control of the companies referred to that they entertain no such purpose, and that their petitions for legislations are not intended to extend their powers outside of the field of the street railway busines. These assurances are of such a character, and come from such sources that we are justified in the statement that no efforts to secure legislation antagonistic to electric lighting companies will be made by the street railway companies above referred to."

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ELECTRICITY.

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EDITORIAL NOTES.

The New Year.

This issue of ELECTRICITY will be the last of the Nineteenth Century to reach its readers. The issue after this will be the first of what might be termed the new era, and it is our purpose and intention to make ELECTRICITY during the new year even more instructive and attractive than ever before. ELECTRICITY'S Educational Series, which is attracting so much attention and by means of which we hope to help electrical workers, will be continued for some little time, and when that series has been completed we can safely promise that another series of equal importance to the electrical fraternity will be begun. We propose to give even more attention than heretofore to the General Electrical News Department, in order that electrical engineers and manufacturers may know at an early a date as possible of electric lighting and street railway contracts about to be let or of electrical supplies wanted. The articles on general subjects will be carefully selected with a view to their instructiveness or novelty.

We anticipate a prosperous year and sincerely hope our friends, readers and advertisers will have no cause to grumble during 1901 at what fate has in store for them.

* * *

Wireless Telegraphy for the Weather Bureau.

In his annual report to Congress, the Secretary of Agriculture devotes considerable space to the work accomplished by the Weather Bureau during the past year, during which time important extensions to the service have been made. Recognizing the advantage that would result to commerce and navigation by the establishment of wireless electrical communication between vessels at sea and exposed points on our lake and sea coasts, and also between islands along said coasts and the mainland, the Weather Bureau was directed to systematically investigate the various methods of electrical communication without wires. The progress made is eminently satisfactory to the Government officials. New appliances have been devised for the transmission of signals, and receivers have been constructed that probably are more delicate than any heretofore made. Messages already have been successfully transmitted and received over fifty miles of land, which presented a rough and irregular surface, conditions most unfavorable for the transmission of electro-magnetic waves. It is believed that the efficiency indicated by such transmission overland is sufficient to operate successfully over several hundred miles of water. The apparatus used is capable of further improvement. The Secretary has expressed the hope that the time is near at hand when the great number of craft employed in the coastwise commerce of the United States and over its great inland seas will be placed in instantaneous communication with the numerous stations of our Weather Bureau, which are located at all important points. The matter is one of such great importance to our commerce that Secretary Wilson has authorized extensive experimentation, which, from the success so far attending the efforts of the officials, will be vigorously prosecuted.

* * *

An Electro-Magnetic Gold-Extracting Process.

Prof. Elmer Gates, of Washington, D. C., who as will be recalled claimed some years ago to have invented a method of utilizing the sun's heat for power purposes, has recently taken out patents on a so-called hydro-magnetic separator, by means of which he proposes to separate gold from magnetic iron or magnetite.

There is nothing especially new or startling in a magnetic separator, as a number have been invented. Mr. Thomas A. Edison brought out one several years ago, which has been made use of to a limited extent with excellent results, so it is claimed. Prof. Gates' apparatus, however, differs somewhat from those already in existence, and a few words regarding it will therefore be in place.

As already stated the object of Prof. Gates' device is to remove from the gold-bearing sand the magnetic iron which such stuff always contains, as a preliminary to separating the gold as in the ordinary way, either by washing or by amalgamation. The apparatus consists of a copper drum, inside of which is an electro-magnet. The core of the magnet is made up of a number of iron plates with fluted edges on the pole face of one end, likewise within the drum, but which approach their fluted edges close to the inside of the copper periphery of the latter. Above is a hopper through which the sand is poured. As the gold, silica and magnetite passes through the hopper it neces-

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sarily touches the side of the drum, which is kept revolving by means of an electric motor. The drum, owing to the magnet inside of it, draws the particles of magnetic iron out of the sand which naturally adhere to its surface while the sand drops into a receptacle below the machine. The particles of iron while magnetically held against the drum are moved downward by it over the wavy lines of force of the fluted magnet face and vigorously shaken so as to detach all foreign matter.

In practical mining work the gold would be left in with the silicious sand, which would subsequently to put through one of the ordinary processes, with a view to separating it from the precious metal. The magnetite once removed, the separation of the gold from the sand becomes comparatively easy, so much so that it is claimed that from two to five times as much of the yellow metal is derived from a given quantity of the raw material. The inventor states that his method is simplicity itself, and further that it costs but three cents for each ton of sand treated.

Another advantage pointed out by the Washington professor is that the iron removed from the sand in the manner just described is an exceedingly valuable by product. At an expense of eighty-five cents a ton it is proposed to reduce it by means of the electric current into lumps, in which form it may be sent to any smelting works.

As to whether the optimistic views of the inventor of this process will be fully realized in practice remains of course to be seen, but it certainly seems more plausible than the scheme suggested some time ago by Prof. Gates for utilizing the energy of the sun.

* * *

The Theft of Electricity.

In several foreign countries, especially in Germany, the question has from time to time been brought up as to whether electricity could be stolen. In spite of the fact that to the ordinary mind it would certainly seem as though a person who deliberately appropriated current generated by the coal paid for by other people should be held liable for theft, the courts have in several instances ruled otherwise. With a view therefore to settling this question once for all, at least in New York State, an amendment was added during the last session of the Legislature, to section 651 of the Penal Code, which reads as follows:

A person who willfully or with intent to injure or defraud: First—Connects a tube, pipe, wire or other instrument or contrivance with a pipe or wire used for the conducting or supplying illuminating gas, fuel, natural gas or electricity in such a manner as to supply such gas or electricity in any burner, orifice lamp or motor where the same is or can be burned or used without passing through the meter or instrument provided for registering the quantity consumed, or

Second—Obstructs, alters, injures or prevents the action of a meter or other instrument used to measure or register the quantity of illuminating fuel, natural gas or electricity consumed in a house or apartment, or at an office or burner, lamp or motor, or by a consumer or other person or persons other than a State inspector or deputy inspector of gas meters or an employe of the company owning any gas or electric meter, who willfully shall detach or disconnect such meter, or make or report any test of, or examine for the purpose of testing any such meter so detached or disconnected: or

Third—In any manner whatever changes, extends or alters any service or other pipe, wire, or attachment of any kind, connecting or through which natural or artificial gas or electricity is furnished from the gas mains or pipes or wires of any person, company or corporation without first procuring from said person, company or corporation written permission to make such change, extension or alterations; or

Fourth—Makes any connection or re-connection with the gas mains, service pipes or wires of any person, company or corporation furnishing to consumers natural or artificial gas or electricity, or turns on or off or in any manner interferes with any valve or stop-cock or other appliances belonging to such person, company or corporation and connected with its service or other pipes or wires, or enlarges the orifice of mixers, or uses natural gas for heating purposes except through mixers, or electricity for any purpose without first procuring from such person, company or corporation a written permit to turn on or off such stop-cock or valve; or to make such connection or re-connections, or to enlarge the orifice of mixers or to use for heating purposes without mixers, or to interfere with the valves, stopcocks, wires, or other appliances of such person, company or corporation as the case may be, is guilty of a misdemeanor.

As a result of this law, which was certainly much needed, the electric lighting companies have been keeping a close watch on suspicious consumers and only recently many persons have been prosecuted in the courts of this city for tampering with electric light and power meters.

Investigations by the Edison Electric Lighting Company has revealed the fact that numerous schemes have been adopted for falsifying the reading of meters. One consisted in bridging the meter, or connecting a wire to the feed and exit wire. Another device for cheating the meter was to bore two holes in its top and with a wire to move the index hands back. Mr. Edwards, auditor of the company mentioned above, is reported as saying:

"We are not suffering any more now from this stealing of the current than we ever were. We are making it warm under the new law for the offenders. That is all. We know pretty nearly everybody who is stealing from us, and we are getting evidence together to convict them. When we bring the charge home to an offender, we propose to press it to the full extent. It is practically impossible for anybody to steal electricity from us for over a month without our finding it out. Obtaining the evidence is not so easy. But there is no device for tampering with the meter that will not leave behind it traces, which a skilled electrician must recognize at once. As conditions were prior to the passage of the law by the last Legislature, we were practically helpless. But now that we have a law under which we can act we are going to push all cases of this kind to the limit."

THE report of the Commissioner of Patents for the fiscal year ended June 30 shows a total of 26,540 patents granted, including reissues and designs. There were 1,660 trademarks, 682 labels and 93 prints registered. Patents that expired numbered 19,988. Allowed applications forfeited for non-payment of the final fees were 4,052. Of the total of 39,815 applications recived 2,263 were for designs, 90 for reissues, 1,759 were for caveates, 2,105 for trademarks, 872 for labels and 127 for prints. On July 1 applications awaiting action by the Patent Office numbered 3,564, which is between 500 and 600 more than on July 1, 1899. The number of applications for patents, etc., received during the fiscal year just closed was 5,000 greater than during the preceding year.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE Standard Underground Cable Company of Pittsburg, Pa., has commenced shipments on the contract for cables and equipment of the electric light and power plant for the City of Mexico. The contract will aggregate $200,000.

AN electric generating plant is being installed by the signal corps post at Fort Myer, Virginia, for furnishing electricity for storage batteries used for instruction and other purposes at that post and also for motor vehicles.

IT was recently learned that the Westchester, N. Y., Automobile Club intends to purchase some of the old bicycle repair shops along the roads leading to the Ardsley Casino, the Knollwood Country Club and the Country Club of Westchester. These shops will be changed into supply stations for automobiles.

THE River Plate Electric Light and Traction Company at Rosario, Argentina, has plans prepared for the new installation, in accordance with the decision of the Arbitration Court. It will be remembered that the work will cost nearly $500,000. A great deal of underground work is to be done. Quantities of new machinery, tools and other material will be required by the company.

SECRETARY LONG has submitted estimates for additional improvements for the Brooklyn Navy Yard, aggregating $113,000. He asks for $35,000 for connecting the pumping plants of Dry Docks 1, 2 and 3 with the electric power house; $50,000 for the enlargement of electric power plant, $3,000 for elevator in building No. 33, and $25,000 for heating, lighting, and elevator in office building No. 22.

A MEETING of the board of governors of the Automobile Club of America was held last week in the office of President Albert R. Shattuck, 11 Broadway, New York City. The most important matters for discussion were the proposed moving to permanent club quarters and the effort about to be made for a test case regarding the presence of gasoline automobiles on ferryboats. No immediate runs are scheduled, the chief interest in that respect now being centered in the proposed test case of all varieties of automobiles, which will be held early in the spring.

IN whatever respects Philadelphia may be slow that cannot be said of one of her trolley lines, which is used to distribute the morning papers. Starting from the heart of the city the car travels at the rate of thirty-five miles an hour, including at least one stop every three-fourths of a mile. It is an experiment

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by the Union Traction Company to test the maintenance of high speed and the evenness of schedule time under conditions peculiarly favorable for securing exact factors for all the problems it is sought to solve. Every trip is observed by electrical experts, the induction is estimated, the power measured, the state of the metal, the thermometrical and barometrical conditions noted, as well as the humidity and fog at the different elevations along the line, and when 1,000 trips have been made the data thus gathered will be considered, with a view of formulating a result to be applied in such directions of economy and accelerated speeds as may be opened up.

ACCORDING to the "Amur Gazette," an extraordinary telephone line has been built by the Amur Goldworks Company at its place on the Seja River, to another establishment on the River Aldan. Instead of insulators, which are difficult to obtain in Siberia, empty bottles have been used on which to support the line. Anyone who is conversant with the characteristics of the Russians, says the London "Electrical Engineer," can quite believe that there was an ample supply of empty bottles in the district.

KEEPING everlastingly at it brings success, is what a well-known firm of national reputation has for its watchword; and while it must be admitted that it is true, yet it is as well to know where to keep everlastingly at it, so that good efforts may not be expended on barren territory; for this reason it may not be out of place to again call attention of electrical equipment manufacturers to the almost undeveloped field that awaits patient work in Mexico. The report of the British Consul, Jerome, especially calls the attention of his countrymen to the fact that electricity is being very largely used in the development of the various industries being established throughout Mexico, as well as for lighting purposes and for street railroad systems. Electric batteries imported into Mexico during the past year amounted to a total weight of 100 tons, at a total value of $45,-547.92, and he also does not fail to call their attention to the further fact, a matter of congratulation to American manufacturers, that of that amount and value no less than 72 tons were imported from the United States and of the remainder, only one and one-half tons were imported from England.

ONE of the large agricultural implement manufacturers has about completed arrangements to engage in the manufacture of the Borsig Electric plow for the American markets. This machine has come into very general use in Europe and will probably become popular here. During the last 14 months no less than 482 farms in Europe have introduced that plowing system. Especially amongst the beet root sugar factories is the plow finding a ready sale. The electrical plow works by means of two wire cables, which run in a parallel direction over the field, about 3 feet from each other. At one end an anchor-carriage is used, which is so constructed that the carriage body itself is never influenced by the working plow, as the anchoring device is fixed to a kind of portable crane attached to the frame of the carriage. Thus the carriage frame itself can never get out of its original direction. As soon as the plow returns to the motor the anchor is lifted out of the soil by the motion of the idle plow cable, and this exactly for the distance which is required for the anchor setting in again. In most cases where the electrical plow is used at present the current is derived from a central station, from which it is transmitted to the field by means of overhead wires. From this overhead wire a movable isolated cable is, at a given point, conducted to the motor car. This latter is placed on one end of the field to be plowed, and the anchor carriage at the opposite end of the field. The plow then travels between the motor car and anchor carriage. As soon as one furrow is completed motor and anchor cars advance exactly one-furrow's space when the work starts again. The whole plant is so constructed that from one and the same branch cable, 90 hectares or about 230 acres, can be plowed.

THE matter of the transmission of power from Niagara Falls to Toronto, Ont., has been taken up by two local corporations, the Toronto Street Railway and the Toronto Electric Light Company. Although no decisive action has yet been taken by either of the companies, at least one of the concerns engaged in the development of power at the Falls is confident of selling a large quantity in Toronto. While three power companies intend to operate at the Falls, the Ontario Power Company has been the most active in endeavoring to find its market away from that district. This company is utilizing the natural advantages offered it, by which it secures its water power from the Welland River, the water being carried over the cliff into Queen Victoria Park, will it is estimated, be able to produce as much power with an expenditure of $5,000,000 as the American company has secured at an expenditure of $15,000,000.

THE largest corundum mill in the world, which is situated in Raglan Township, Renfrew County, Ont., was started on the 21st inst., and when in full operation, it will turn out more corundum than all other plants in existence. The full capacity of the mill is 15 tons of corundum per day, reclaimed from 100 tons of rock. The orders are chiefly from great engineering works in Europe and the United States. Mr. George C. Edwards, of Bridgeport, Conn., is president of the company.

A DISPATCH from Honolulu states that wireless telegraphy is meeting with much success in Hawaii. A large number of messages have already been transmitted from one island to another. The company which is seeking to put the system in operation lately chartered the yacht La Paloma to cruise among the islands to test the possibility of communicating with ships at sea from land. The tests are said to have been successful. Experiments are now in progress to determine the best locations for the stations on several islands. When this has been completed stations will be connected by ordinary telegraph lines with the centers of population, and regular transmission of commercial business will be begun.

IN a leading article the "Elektrotechnische Zeitschrift" comments on the increasing practicability of equipping standard-gauge railways for electric traction, says the "Electrical Engineer," London. Since considerable distances are involved by railway work, the transmission of energy by means of high-tension multi-phase currents is a fundamental basis for such projects opines the authority in question. But the transformation of the energy prior to its final conveyance to the propelling motors of the trains may be accomplished in various ways. As a matter of fact, three systems have already been tried. One of these consists in the conversion of the high-pressure multiphase currents into continuous currents of moderate pressure by means of fixed transformers and rotary converters placed in sub-stations. A second system consists in converting the high-pressure multiphase currents into multiphase currents of moderate pressure, and conveying the same to the trains through three separate conductors. In this case at least two special conductors are requisite, while the rails may constitute the third, and the trains would, of course, be equipped with multiphase motors. The third system consists in conducting the high-pressure multiphase currents by means of three overhead wires direct to the train, which is equipped with transformers and multiphase motors. As regards the relative values of the three systems, expert opinions differ.

THERE are three street cars on the Indianapolis, Ind., line that disturb no man's sleep and frighten no horse into hysterics with demoniacal noises. They are equipped with wheels made by the Noiseless Wheel Company of Indianapolis—C. E. Kregelo, president; Israel Hoagland, vice-president and inventor; A. W. Wishard, secretary-treasurer. The wheel is patented. It looks like other car wheels, and is made in different sizes and weights for street cars and railroad freight and passenger cars. Cars in Chicago have been equipped with them for six months, and demonstrations of their advantages over common wheels have been made to different railroad companies. The body of the wheel and the tire are separate. The tire is bolted to the wheel, and between them is a cushion of hard pressed paper. The chief advantage of the wheel, it is averred, is not that it is noiseless, but the ease with which repairs may be made. Now, when a car wheel goes flat, the car must go out of use for a week or more, be taken to the shop, the truck removed, and a new wheel substituted for the old one. It is said that this wheel can be produced for $20.

A SPECIAL cable dispatch from London to the N. Y. "Sun," dated December 22, states that Prof. J. A. Fleming, the well-known electrician of London University, is understood to be engaged in important experiments in connection with a novel form for the transmission of electrical energy. There is reason to believe that the professor has discovered the means by which such power can be distributed without wires by utilizing the ether as Marconi does for ordinary signaling.

A TURNTABLE for trolley cars has been patented by an Ohio inventor. It is so arranged that when the car is driven on it the front wheels rest upon two rollers coming up through the track, and, by gently starting the motors, these revolve under the car and communicate their motion through proper gearing to the turntable itself, and thus the car is turned around by its own power, the trolley swivelling on its base and staying on the wire. The crew of the car do not have to descend from it, and it is asserted that the apparatus works very quickly and successfully in practice.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 7.

INSTRUMENTS FOR ELECTRICAL MEASUREMENTS.

Electrical measurements cannot be made as we would measure steam and water, for in the latter case we have substance; however we must have a means for measuring and calculating which will be just as reliable electrically as the other measurements are in their relation to steam and water.

An electric current represents energy, and consequently if properly applied will do work—the amount of work performed depending on the amount of electrical action. Calculation of rate of flow and pressure or voltage then depends directly on the effect produced. Let us get this a little more clearly in another way. An electric current will induce magnetism and the strength of that magnetism will depend entirely on the amount of current flowing, for increase the rate of flow and you will increase the magnetic strength produced by it. Now if we employ this magnetic condition to do work then the amount of work done will indicate the strength of the magnet, which in turn depends directly on the amount of current flowing. If we manufacture an instrument based on this principle then you can say that a certain amount of work done will represent a certain rate of flow of the electric current.

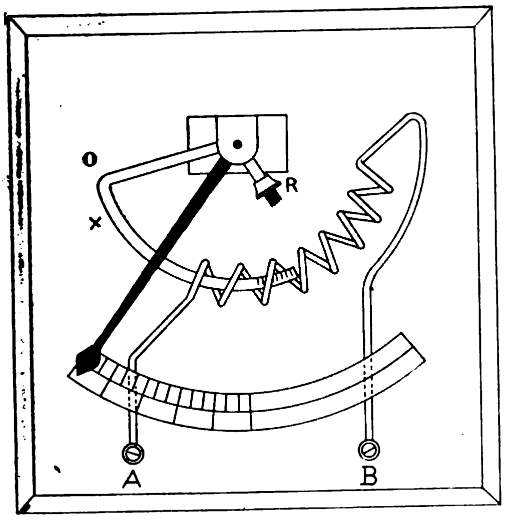

FIG. 1.

Fig. 1 gives an illustration of this method of calculaton and also is a diagram of an instrument widely used to-day for measuring the amperes flowing in a circuit.

If you connect a circuit to the posts, A B then the current will flow through the coil producing a magnetic condition that in turn will act on the iron X, which will be drawn into the coil and the distance that it will be drawn will depend entirely on the strength of the magnetic condition acting upon it. By having an arrow attached, as described in the figure, it gives a means of reading the effect produced.

Suppose we connect an instrument of this description in series with a standard ammeter, we could then mark off on the scale points indicating the amount of current flowing, corresponding of course to the amount indicated by the standard instrument, for the same rate of flow would be acting on both instruments. This would be what is known as calibrating an instrument. Before calibrating a set of this kind see that the arrow points to zero after the instrument is permanently placed. If it be a little out either way the adjusting screw, R can be used to set it correctly.

By properly balancing this system a fairly uniform scale can be secured and for special purposes the scale can be expanded to any point desired. This type, however, has an inherent defect in measuring direct current, due to the iron not responding readily to slight changes of current, which makes a sudden increased reading lower that it should be and a sudden decreased reading higher than it should be. This is sometimes called "magnetic lag." However, when alternating currents are measured this does not come into play, but in that case the precaution must be taken to laminate the core so that local currents will not be induced in it. This law will be taken up later on in the series.

The use of the magnetic law in measuring is used in other ways than that just described. A very popular one is where the measuring coil consists of a number of turns of fine wire, wound on a rectangular form, and this coil rotates in a concentric annular space through which passes a permanent magnetic field. When current enters this coil, it tends to deflect it from a fixed position, which is reacted by differential springs; in this way deflections can be obtained which are proportional to the current flowing.

Although the magnetic effect is the means most commonly used for measuring, there are two other effects produced by an electric current that may be used as a basis of calculation. They are the electro-chemical effect and the heating effect.

Electro-chemical measuring is based on the fact that an electric current flowing from one metal to another through an acid solution will decrease the weight of one and increase the weight of the other by the action of electroplating. This effect will depend on and be governed by the amount of current flowing. An example of this method is the Edison meter, not so commonly used now as it was several years ago.

The third method of measuring depends upon the heating effect of a current when passed through a resistance, together with the fact that a wire will expand when heated. This method is used very little outside of the laboratories.

TO MEASURE ELECTRIC PRESSURE.

The most familiar means of measuring pressure is to measure the amount of current or rate of flow which it causes to pass through a known resistance. An instrument for doing this is called a voltmeter, and the principle it involves is just the same as that described in Fig. 1, except in a voltmeter the coil of wire should be of a known high resistance. Supposing in our voltmeter the coil that is acting upon the iron core to be of 100 ohms. Now according to Ohm's Law one volt will force .01 of an ampere over that resistance while 100 volts would force 1 ampere over the 100 ohms, so that the instrument while being effected by the amount of current flowing must necessarily indicate the pressure causing it to flow, whereas the mechanism of a voltmeter and an ammeter may be the same and depend upon the magnetic effect produced by the flow of current for their action, yet they differ in the fact that an ammeter must necessarily have a low resistance coil, for it is connected in series with the circuit and carries all the flow, while a voltmeter in measuring pressure must be connected across the circuit and have a high resistance, for it only requires enough flow to operate the instrument, the amount of current flowing over it of course depending on the pressure forcing it.

THE MEASUREMENT OF RESISTANCE.

All useful and practical methods of measuring electrical resistance depend directly upon the indication of Ohm's Law. The simplest means of calculating a resistance is by comparison, that is, by comparing the effects produced in a known resistance to that of an unknown, or by adjusting a known resistance until the amount of current flowing over it will be equal to that flowing over the unknown resistance when both circuits are connected to a common source.

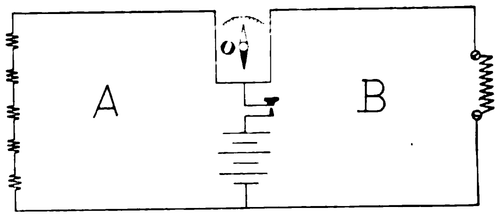

FIG. 2.

In Fig. 2, suppose the resistance in circuit A be the known and circuit B be the unknown resistance which it is desirous of measuring.

If both circuits be equal, the amount of current flowing in each will be the same, but if not equal, more current will flow over the lower resistance than over the higher.

If a galvanometer be placed in the circuits at point O the needle will indicate which side has the greater amount of flow, and if both be equal it will be affected by both the same and remain at the zero point. So by plugging in or out resistance in the known side we can get both equal and when such a condition is indicated by the needle the circuit is supposed to be balanced. The unknown will then be known, because it will be equal exactly to the known side.

HINTS ON THE USE OF INSTRUMENTS.

Never connect an ammeter across a circuit. Always place it in series.

A voltmeter should be connected across the poles of the circuit to be measured.

To measure resistance by an ammeter, divide the voltage by the amount of current flowing which will give the resistance. Suppose for example, there were 110 volts pressure and the amount of current which that pressure was causing to flow through a circuit showed on an ammeter to be 2 amperes, then the resistance of the circuit must be 55 ohms.

To calculate voltage by the use of an ammeter, multiply the amount of current caused to flow over a known resistance by the resistance, which will give the voltage. For example, if an ammeter shows that there be 5 amperes flowing in a circuit of 2 ohms resistance then the pressure must be 10 volts.

Article No. 8 will be entitled "Coils and Coil Making."

The Manhattan Elevated Railway of New York has ordered from the Allis Company of Milwaukee 8 engines of 5,000 hp. capacity each.

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THE NERNST LAMP.

The London "Electrician," in its issue of December 7, describes as follows the Nerst lamp as manufactured by the Nernst Electric Light Company, Ltd. When the Nernst lamp patents were disposed of, it will be remembered that the Westinghouse Company acquired the patents for the United States and Canada, Messrs. Ganz & Co., the rights for Austro-Hungary and Italy, and the Allgemeine Elektricitäts Gesellschaft the patents in Great Britain, Germany, and other European countries. Unless, therefore, the last-mentioned company sells its patent rights for Great Britain to a British manufacturing firm, it appears more than probable that the Nernst lamps used in England will be made in Germany. Each company that has acquired Nernst patents has been left to work out a practical form of lamp on its own lines, and the samples shown us differ in several respects from the model adopted so far by the German company. Neither of the two types are yet on the market, but that of the Nernst Electric Light Company (Ltd.) has been shown as the pattern that will soon

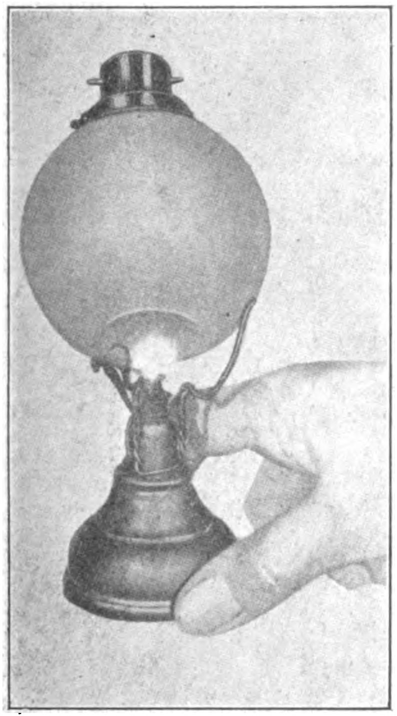

Fig. 1.—Simple Lamp with Spirit Lighter.

be made in quantities—although it is understood that orders for shipment would not yet be accepted, and that prices could not be quoted at present.

The efficiency adopted by the company is somewhat lower than what has hitherto been associated with the idea of the Nernst lamp. Although the incandescent rod of refractory material, which for convenience we will still call the "filament," may furnish light at an efficiency of little more than 1 watt per candle, a resistance absorbing a certain amount of power has to be placed in series with the filament in order to steady the current. As is well known, the filament of the Nernst lamp is made of a material which does not conduct at low temperatures, but becomes a conductor at higher temperatures, and at these higher temperatures its temperature coefficient for resistance has still a fairly high negative value. It is, therefore, necessary to add a resistance coil with a positive temperature coefficient in series with the filament to prevent instability, and this coil has a resistance equal to 10 per cent. of the resistance of the lamp. This does not account for the whole decrease of efficiency below what was originally attributed to the Nernst lamp, for the lamps made by the company are made to a standard of 1.7 watts per candle power; so it may be reasonably concluded that a lower temperature is employed than in the original experimental lamps, and that this may account to some extent for the much longer lives, of 500 to 1,000 hours, and even more, which are now obtained.

Our illustrations show the form the Nernst lamp has taken under the hands of the company, through the work of Mr. Drake, Mr. Sheppard, and the consulting engineer, Mr. James Swinburne. Fig. 1 is an external view of the simple lamp, which requires a spirit lamp as lighter, Fig. 2 shows the same lamp without its cover, Figs. 3 and 4 illustrate a self-lighting lamp, and Fig. 5 is a pattern for high-candle powers. The simple lamp for lighting with a spirit lamp has a globe open at the bottom, as shown in Fig. 1. The filament, which is of about the thickness of a pin, is held between platinum wires, the junction between the platinum and the filament being covered with a blob of similar material as that of which the filament itself is composed. This junction gave a good deal of trouble at first, especially the one at the anode or + pole in the continuous current lamp. It was found that considerable heating took place here, and that, at a spot near the anode, the filament itself diminished in thickness. To overcome this, the platinum wire wound round the end of the filament is brought to the surface of the covering material, and in the case of larger lamps projecting pieces of platinum, to assist in the dissipation of the heat, have been tried with success. The thicker wires seen in Fig. 2 leading to the platinum wires are of nickel. The steadying resistance is of fine platinum wire, wound on a piece of unglazed biscuit porcela the latter material being employed for all the non-metallic parts of the renewable portion of the lamp.

Air is necessary for the burning of the lamp, at all events with continuous currents. This is probably because a supply of oxygen is necessary to prevent electrolysis of the magnesia, which is the basis of the filament, or perhaps

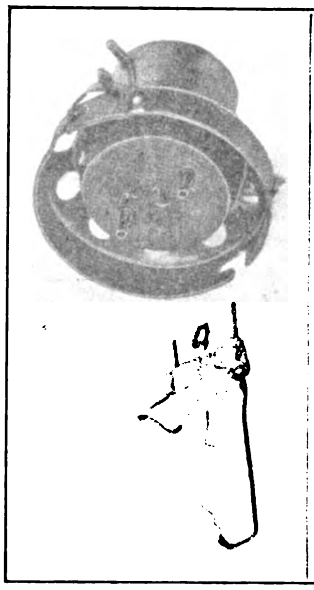

Fig. 2.
Simple Lamp Without Globe.
Filament and Resistance Withdrawn.

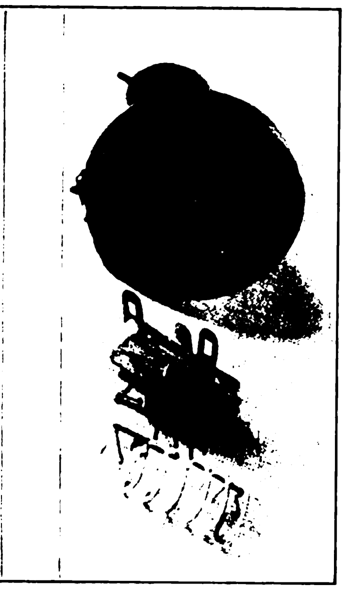

Fig. 3.
Self-Lighting Lamp Without Globe.
Filament and Attachments Withdrawn.

Fig. 4.
Self-Lighting Lamp
Complete.

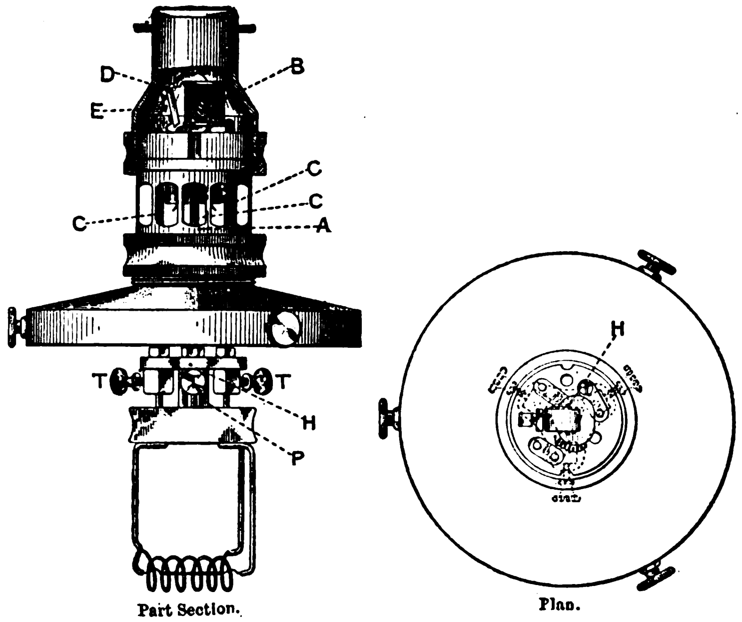

Fig. 5.—50-cp. 100-volt Lamp. Half Size.

rather to effect the reoxidization of the magnesium which is the product of the electrolysis. The top of the cap which fits over the globe is therefore perforated with a few large holes, the self-lighting lamps being in globes closed at the bottom. In the self-lighting lamps, the platinum spiral which acts as the heater forms part of the renewable portion of the lamp. This is clearly seen in Fig. 3.

It is proposed to supply these renewals at a low cost, receiving in part payment the old ones in which the filament is burnt out. The white spiral seen in the figure is of porcelain —the platinum spiral is formed of a long piece of fine wire wound on the small porcelain rod before the latter is bent into a spiral shape. This bending is done in the blowpipe after the platinum coil has been wound on it. The self-lighting lamp has a resistance coil of platinum wire similar to the simple lamp, but the renewable part has three contacts to allow of the heating coil being switched off as soon as current passes through the lamp. This coil always remains in position round the filament, however. Two of the contacts are made by hooks in the base-plate fitting into the two eyes seen in the figure. These are placed at different centers so that the right connections must be made in putting in the filament block. In some later lamps the still simpler expedient has been adopted of having one hook shorter than the other. The third connection is an ordinary plunger and spring, as in an ordinary center-contact incandescent lamp-holder. Above this base-plate, and in what may be called the hood of the lamp, is the electromagnet for cutting out the heating coil as current passes through the filament, the actual cap which fits into the ordinary lamp-holder being above this again. Since this base-plate and the cap and hood fitting over it is to all intents and purposes a lamp-holder, it is difficult to see why the company adapt all their lamps to fit into any ordinary holder as well, thus introducing an unnecessary intermediate contact and retaining the plaster of paris cap, which is the weakest part of the carbon filament lamp. Moreover, by dispensing with the old lamp-holder, the price of the Nernst lamp complete would have to be compared with that of the carbon filament lamp plus its lampholder, and this would tend to overcome the initial cost difficulty. Lamps with B C terminals should only be required, one would think, when it is indispensable to utilize existing fittings.

As there is no vacuum space between the filament and the lamp cap, the latter would get very hot in the case of lamps of large candle-power and damage the insulation on the electro-magnet. To meet this Mr. Drake has devised the form of lamp shown in Fig. 5. The connections CCC between the two parts of the lamp pass through a sort of cage, A, and an air space is thus interposed. It is to be hoped, however, that the bare connections CCC will be insulated, when the lamp is put on the market, as at present they afford too great a temptation for making short-circuits. The contacts between the renewable part and the permanent part of the lamp are in this case formed by ordinary block terminals TTT, and the correct connections are ensured by cutting a hole, H, of trapezoidal section, in the part of the base in the center of these, into which fits a similarly-shaped projection P from the base of the removable part. The steadying resistance is not seen in the figure; it is similar to that employed in other lamps.

The electromagnetic device, shown in Fig. 5, for switching out the heating coil is the same as is employed in the other self-lighting lamps made by the company. The small coil B is in series with the filament, and, as soon as current passes through it, the armature D is attracted, breaking the contact E, which is in series with the heating coil. Although very simple, this device gave considerable trouble to design so as to avoid humming in the case of alternating-current lamps. A still more compact form is now being made experimentally, in which the axis of the coil is parallel to the base, and the contact is in the base itself. This modification, together with the device of making the contact hooks long and short, instead of at different centers (already alluded to), reduces considerably the size of the lamp.

The company's offices are lighted with Nernst lamps of various sizes, and their appearance compares not unfavorably with carbon filament lamps and fittings. Comparing them with the cumbrous self-lighting lamps exhibited by Mr. Swinburne at the Society of Arts about two years ago, it is evident that great progress has been made. Whether, however, the shareholders of the Nernst Electric Light Company, Ltd., were well advised in investing £270,000 (out of a total capital of £320,000) for the patent rights in distant lands of an invention which it has taken two years of experiment to prepare for the market, is another matter. No doubt we shall learn the present opinion of the shareholders on the question at the annual meeting of the company which will be held shortly. In the meantime we congratulate Mr. Swinburne and the technical staff of the company, on the good work they have done in developing Nernst's invention into what promises to be a thoroughly practical and useful piece of apparatus, calculated more than ever to cheapen and popularize electric lighting.

I.—HIGH TENSION POWER TRANSMISSION PLANTS IN FRANCE.

BY FRANK C. PERKINS.

Monophase Plant at Allevard-les-Bains

A number of high tension power transmission plants have been installed in France using polyphase and monophase alternating current apparatus. While the Swiss Engineering firm, Compagnie De L'Industrie Electrique of Geneva, has been introducing a direct current high tension system designed by M. Thury, with more or less success. They have not been extensively used in France, and England, but have been operated in Italy and Switzerland quite successfully.

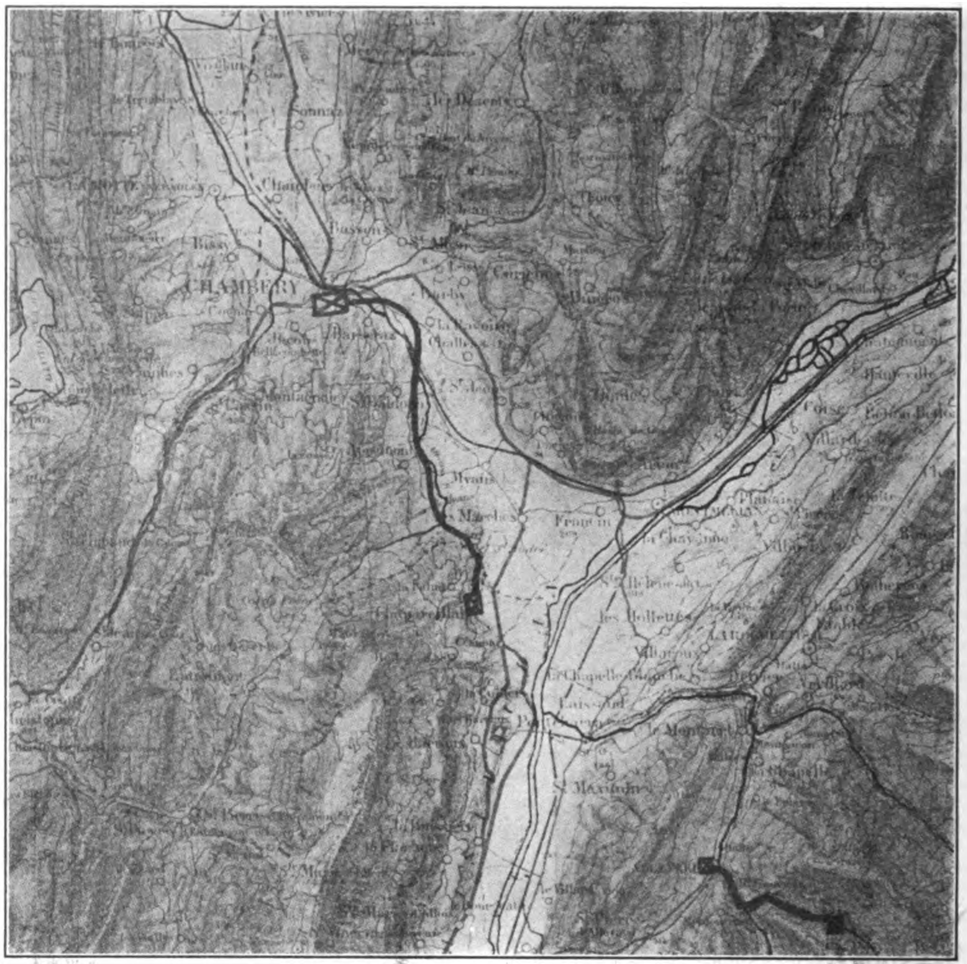

FIG. 1.—HIGH TENSION MONOPHASE AND TRIPHASE TRANSMISSION LINES IN ALLEVARD-LES-BAINS AND CHAPAREILLAN-CHAMBERY, FRANCE.

Alternating current power transmission plants have been a specialty with the Société L'Eclairage Electrique of Paris for a number of years. The earliest installations had a line potential of 5,000 volts. Plants of this character were introduced at St. Sebastian, Chapareillan-Chambery, Lourdes and at Amparo (Bresil).

It was found necessary as the distances were increased to raise the potential in order to reduce the losses and reduce the first cost for copper conductors. It was therefore decided that the plant at Blanjeu should be operated at a potential of 10,000 volts. This plant gave such good satisfaction and the difficulties encountered in insulation were so successfully

met that a later project for lighting thirty-five villages in the valley of Gresivanden was carried out to completion, using a line potential of 12,000 volts. This plant was located at Lancey and the apparatus installed was of the monophase alternating current type.

The next increase of potential was on the line between Grenoble-Voiron and Engins. This installation is of the three-phase type and 15,000 volts were successfully used.

The length of the lines increasing with each installation (Fig. 1), the potential was also necessarily increased to save loss on the line, and first cost of circuits. In the above gradual increase from 5,000 volts to 15,000 volts, the generators were in every case low potential machines of either the monophase or tri-phase type, and the increase of voltage was attained by the use of step-up static transformers.

The power transmission line of the Allevard-les-Bains (Isere) installation, Fig. 1, is five kilometers long. At various points on the transmission line small sub-stations, Fig. 2, are equipped with transformers of various sizes for supplying local distribution. The power house at Allevard is divided into two parts, separated by a stone wall, the turbines being installed in one part and the generators, switchboards and exciters in the other, Fig. 3. The generator room contains two alternators designed by M. Labour, of Paris, electrical engineer of the firm Société L'Eclairage.

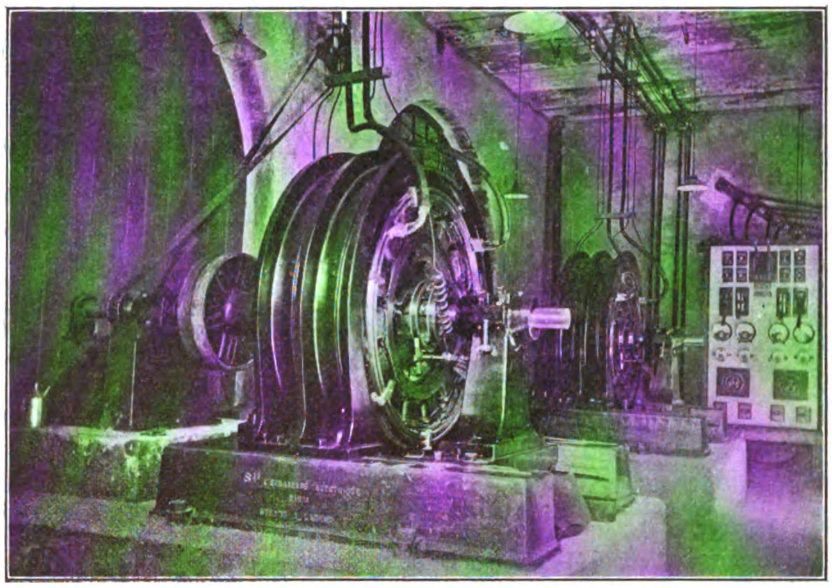

Fig. 3.—Generator Room at Allevard-les-Bains.

Fig. 2.—Step-down Transformer Sub-station on the Allevard-les-Bains (Isere) Line.

These machines are directly coupled to the turbines in the adjoining room. The alternators are of the monophase type having each a capacity of 150 kilowatts. The primary voltage generated by the machines is only 120 volts and step-up transformers are used for raising the potential on the line to 2,400 volts. At the various small sub-stations, Fig. 2, which are equipped with transformers, the voltage is transformed down to 110 volts for the low tension lighting circuits. In this country the transformers would be placed on poles or on the sides of the buildings, and separate transformer buildings are not usually provided as abroad unless the capacity is of such size as to require a special foundation.

The next installation considered will be that at Chapareillan-Chambery Transmission Plant, and illustrations will be given in the next issue of "Electricity" of exterior and interior of the power house belonging to this system located at Chapareillan.

ELECTRIC OSCILLATIONS*.

The experiments in wireless telegraphy which have been going on of late lend an additional interest to the subject of "Electric Oscillations and Electric Waves," which Professor J. A. Fleming, M.A., D.Sc., F.R.S., has selected as the theme of his Cantor lectures, the first of which was given at the Society of Arts on the evening of November 26. He defined electric oscillations to be an alternate current of high frequency, of as much as a million, or several million alternations, per second. Frequency exercises a great influence on the behavior of currents. For instance, in dealing with direct currents, resistance is one of the chief factors of which we have to take account, but with increased frequency the phenomena connected with inductance and capacity became of far greater importance, particularly the former, and we have to part company with many of our notions on the subject of electricity. With currents of high frequency, the flow is not necessarily in the same direction in all parts of a given conductor, nor is its volume constant. Alternate currents of low frequency must have a closed circuit for their generation, but oscillations may occur in a straight wire. To produce oscillations, ordinary mechanical means are useless; it is impossible to move coils of wire with sufficient velocity to produce them. The only method is by means of Leyden jars

*From "Engineering," London.

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and condensers. The oscillation, however, is not due to the condenser itself, but to a peculiar property in air. This property is that air is a perfect non-conductor until the pressure reaches a certain critical value, when it suddenly breaks down and becomes a conductor. To obtain oscillations, two qualities are necessary in the circuit—capacity and inductance. as mechanical analogies aid the comprehension of electrical phenomena, Dr. Fleming expresses the conditions necessary for oscillation as follows:

1. A self-recovering displaceability.
2. Something like inertia.
3. Suddenness of release.

The displaceability makes the thing go when let loose, and the inertia makes it overshoot the mark, so that it can come back. The release must be sudden, or else the thing will slide slowly to a position of rest and stay there. For instance, if mercury be raised in one leg of a U-tube by blowing into the other, and then released by letting the air go, the column will oscillate up the two legs alternately several times. If, however, the air be allowed to leak out slowly, the mercury will come steadily to a position of equality in the two legs.

It was suspected long ago that the discharge of a Leyden jar was not in one direction only. In 1842 Henry remarked that the magnetism of needles by the discharge was very irregular, sometimes in one direction, sometimes in another, and sometimes not at all. In 1847, Von Helmholtz dealt with the same subject, and in 1851, Thomson (Lord Kelvin) gave the first exposition of the phenomenon. Dr. Fleming showed by an experiment that the discharge from an induction coil through a vacuum tube is in one direction only. It is visible to the eye that this is so, for the illumination is different at the two ends of the tube. When, however, the discharge is obtained from a Leyden jar, the appearance of the glow is uniform, and does not change on the connections being reversed. Such a discharge viewed in a revolving mirror is seen to be double, flowing first in one direction and then in the other; it is oscillating. Prof. Boys has photographed the discharge by arranging lenses around a rapidly-revolving wheel, and throwing the pictures of the spark on to a sensitive plate. The result is a series of marks, like a succession of Morse dashes. From the speed of the wheel it was calculated that, in this instance, there were 3,000 oscillations per second.

Below a pressure of 300 to 400 volts air is a complete non-conductor. Above that pressure, as already stated, it breaks down, and the sparks pass. It is not completely understood what the action is, but it is thought that the molecules break up, and the electrically charged ions go in opposite directions. J. J. Thomson has shown that no electric force will break up a molecule, but it is possible that vibration may do it. A coherer has much resemblance to air in this respect. Under a pressure between 1 and 2 volts it scarcely conducts at all; but under a higher pressure it instantly develops high conducting powers. The following table gives the dielectric strength of various insulators:

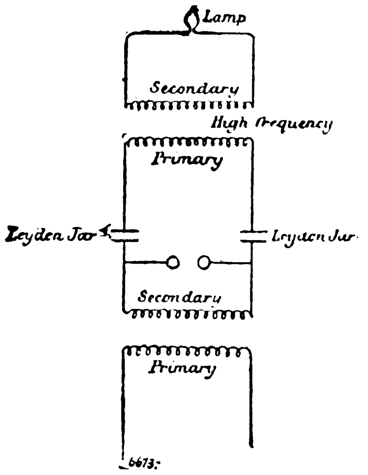
	Kilowatts per Centimeter.
Micanite	4000
Mica	2000
Ebonite	54
Linseed oil	83
Cotton seed oil	67
Air 2 millimeters thick	57
" 16 " "	27

The last two lines are very noticeable, the thinner layer having the greater strength. The greater strength of oil, as compared with air, suggests its use in the spark gap. It has been tried by Dr. Fleming and also by Marconi, but the results were not encouraging. It has more strength, but there is less suddenness in the giving way. It does not snap.

The air between two charged balls is in a state of strain. When the air breaks the strain vanishes and we get current, and the current sets up lines of magnetic force. The current also expends its energy in reproducing the state of strain, and so the action goes on backwards and forwards, the strain and the rupture following each other until the energy is frittered away.

A frequency of a million per second does not mean that there are a million oscillations, but that the oscillations are at that rate. Generally there are a few—four or five—oscillations, and then a long wait, the intervals being comparable to a clock giving twelve ticks and then standing twenty-four hours; then giving twelve more ticks, and so on. The problem awaiting solution is how to make the oscillations persistent.

Oscillations decay and die away. They are damped by the alternating magnetic field they set up. This field was demonstrated by Dr. Fleming by the use of two coils, one contain-



ing a spark gap and the other a tiny electric lamp. When the oscillations were set up by the discharge of the Leyden jars, the lamp lighted up, although its coils were some feet away from the other, and not close, as shown in the figure. "That," said Dr. Fleming, "is not wireless telegraphy, but wireless electric lighting." When he interposed his body between the two coils it made no apparent difference, and neither did a board. A piece of thin perforated zinc, however, completely cut the influences, and the light failed. If the frequency had been of the alternating-current order of 100 per second the zinc would have had very little effect, as its electric resistance was great. But as the frequency is raised the influence of the zinc increases. If cooled to absolute zero, so as to become a perfect conductor, it would cut off low frequency vibrations also. The explanation of the action of the zinc is that the primary coil sets up Foucault currents in it, and these create a magnetic field on the other side of opposite phase, which balances the field set up by the first coil.

The two coils constitute an oscillating transformer. If the second has a large number of coils, then it becomes a step-up transformer. In making such an apparatus there are certain conditions to be observed, and these are generally opposite those governing the usual transformer. It is important that the turns of the coil shall be kept far apart. The closer they are the greater the inductance, and inductance throttles the discharge. Ebonite does not make a satisfactory non-conductor for such coils; glass is the only substance to use. One coil is put in the interior of a glass jar, and on the outside there is a single layer of gutta-percha covered wire. A coil like this will raise the potential to any desired point—10,000 or 40,000 volts. The great point is to space the turns of the coil far apart, to prevent impedance. Only one layer must be used, and more turns be gotten by lengthening the glass core. Dr. Fleming showed sparks 6 feet long, in vacuum tubes obtained in this way.

Secondary oscillations can not only be created in metallic conductors, but also in gaseous conductors, that is, transformers may be made in which the secondary conductor is gas. Dr. Fleming showed a glass cylinder with hemispherical ends, exhausted to 1 millimeter of mercury. This cylinder was some 6 inches in diameter and 10 inches long. Around its center was a coil of six turns of wire, and when an oscillating current traversed this coil the gas in the cylinder lit up in circular rings of light. It was a very pretty and striking experiment. When the cylinder was wrapped in silver paper there was no effect. The metal film acted like the zinc plate by creating a magnetic field opposite in phase to the first.

The inductance caused by convolutions lying close together was strikingly illustrated by Dr. Fleming. He used two wire coils as at first, but in series with the second he put a very loose helix of wire on a non-conducting core. The coils of the helix could be drawn wide apart, like the threads of a worm, or pushed close together like a fine pitched screw. In the former case the lamp shown in the diagram burned, but when the coils were suddenly pushed together it was extinguished. Iron, also has the effect of increasing inductance, although Hertz thought that iron could not be magnetized by oscillating currents. A bundle of copper wire placed in the coil makes very little effect on the light, while a bundle of iron wire of the same size effects a marked diminution of the light.

High frequency currents do not penetrate the mass of a conductor, but keep on the surface. Rayleigh showed long ago that alternate currents have not a uniform flow over the cross-section of a conductor, and gave a formula for the resistance of a conductor to alternating currents. This, however, does not apply to high-frequency currents. With a frequency of a million per second, a current does not penetrate into an iron conductor more than one two-hundredth millimeter; it penetrates into copper 15 millimeters. The skin effect increases the apparent resistance, but decreases the inductance. There are, broadly, three kinds of resistances to consider: (1) Ohmic resistance; (2) resistance to alternating current of 100 periods; and (3) resistance to oscillating currents.

The New Jersey State Grange, Patrons of Husbandry, concluded its annual session recently. A number of resolutions were adopted one of which demands the repeal by the Legislature of the law of 1896, which prohibits trolley companies from carrying freight, and alleges that the law was in opposition to the interests of the farmer.

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BIRDSEYE VIEW OF THE PAN-AMERICAN EXPOSITION.

It is promised for the Pan-American Exposition that it will surpass in beauty any previous exposition in the world's history. It is also expected that it will outrival its predecessors in many other ways, for at no time have such wondrous achievements in all arts, such perfection in the hundreds of trades been attained. Accompanying this article is a birdseye view of the Exposition plot, showing the magnificent work in its completed state.

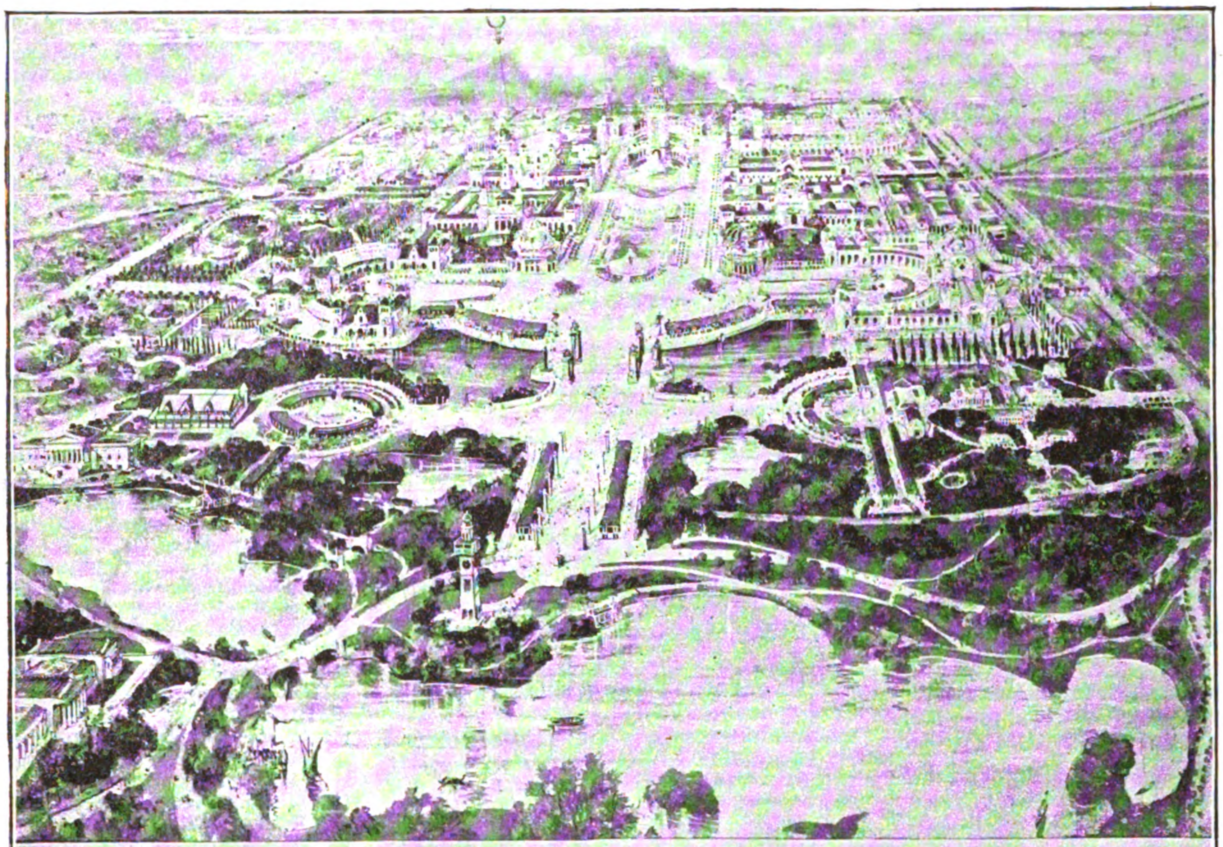
The symmetrical grouping of buildings will be at once noted by the observer. Beginning at the formal approach, just north of the lake, the eye follows northward between two rows of ornamental columns to what is known as the Forecourt. East of this are the State and Foreign Buildings forming in themselves a very interesting feature of the Exposition. Near these, also, are the buildings for the special ordnance displays, representing the products of several hundred manufactories in this line of work. West of the Forecourt will be the outdoor horticultural displays and the Women's Building. We cross now the Triumphal Bridge which will be remarkable for its tall piers richly ornamented with statuary, the product of the genius of Karl Bitter, the Director of Sculpture, and other famous sculptors. On either side are the Mirror lakes which form a part of the Grand Canal, more than a mile in length, which surrounds the main group of buildings. We come next to the Esplanade, which is nearly two-fifths of a mile long and 450 feet wide. The western end of the Esplanade is enclosed by the Horticulture, Graphic Arts and Mines Buildings. The eastern end is shut in by the Government group of three large buildings. Sunken gardens with elaborate fountains and many groups of sculpture occupy the two arms of the Esplanade and the decorative features throughout this broad space are very numerous and beautiful. North of the Esplanade is the Court of Fountains, with the Ethnology Building on the right and the Music Building on the left. Two subordinate courts also open into the Esplanade from the north, the one on the right being known as the court of Cypresses and the one on the left as the Court of Lillies. Next, north of the Ethnology Building on the right, and fronting upon the Court of Fountains, is the Manufacturers and Liberal Arts Building and on the opposite side the Machinery and Transportation Building. In the Court of Fountains is a large pool, having an area of about two acres and containing many beautiful fountains. Proceeding again northward we come to the Mall, a broad avenue, half a mile long extending from the eastern boundary to the western gate of the Exposition. Fronting upon the Mall on the right is the Agriculture Building and on the left the Electricity Building. We now arrive at the most conspicuous feature of the Exposition, the massive Electric Tower, 391 feet in height. This tower stands between the Court of Fountains and the Plaza, in a broad pool, about two acres in extent. This will be the most ornamental feature of the great Exposition and will be the centerpiece for special and elaborate electrical illumination. Immediately north of the Electric Tower is the Plazza, with its beautiful sunken garden and bandstand in the center, the Propylasa, or monumental entrances at the north, the entrance to the Stadium on the east and the entrance to the Midway on the west.

At night all the buildings will glow with the soft radiance of thousands of electric lights, making a scene of unrivaled brilliance and splendor. More than 200,000 lamps will be used in the electrical illumination.

It should also be added that the Midway at the Exposition will be the most extensive and novel that has ever been prepared. It will be 3,000 feet long, having more than a mile of frontage. Over thirty very interesting features, many of them covering several acres, will make up the gigantic collection of wonders.

The Athletic features of the Exposition will be shown in the Stadium, which covers about ten acres of ground and contains a seating capacity for more than 12,000 people. All of the exhibit buildings will be filled to completion with the very latest products of Pan-American genius and industry, and will offer an opportunity for every inquiring mind to learn a most interesting lesson of New World progress and civilization.

The power for Exposition uses is furnished principally from Niagara Falls, which are situated only a few minutes' ride from the Exposition grounds. Buffalo is a city of nearly 400,000 population and is preparing in every possible way for the reception of millions of visitors in 1901.



BIRDSEYE VIEW OF THE PAN-AMERICAN EXPOSITION BUFFALO, MAY 1, TO NOV 1, 1901.
GROUNDS HALF A MILE WIDE, MILE AND A QUARTER LONG — 350 ACRES
COPYRIGHT 1900 BY THE PAN-AMERICAN EXPOSITION CO.

Meeting of the Northwestern Electrical Association.

The Ninth Annual Convention of the Northwestern Electrical Association will be held at the Hotel Pfister, Milwaukee, Wis., commencing on Wednesday morning, January 16th, next. Reports and papers on subjects of special interest to central station men will be read and discussed. The hotels and railroads have made special rates for the occasion, and a large attendance is expected. Secure hotel accommodations in advance. For rooms, exhibit space, etc., apply to manager Hotel Pfister; and for wiring, current, etc., for exhibits, to

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Mr. O. M. Rau, 451 Broadway, Milwaukee. For information as to railroad rates, special train and car arrangements, address Mr. James Wolff, chairman, 320 Dearborn street, Chicago, An attractive entertainment programme has been arranged, and a pleasant and profitable time is assured to all who attend the convention. The association extends a cordial invitation to all electrical men.

LEGAL NOTE.

James D. Feeter of Little Falls, N. Y., has been appointed receiver for the Dolgeville, N. Y., Electric Light and Power Company for the purpose of foreclosing a mortgage of $50,000 held by the National Trust Company of New York City.

Big Railroad Deal in Connecticut.

A dispatch from New Haven on the 21st inst. says that the trolley road and electric light syndicate known as the United Gas Improvement Company has made an opening wedge for the biggest electric railroad deal in Connecticut history. It secured an option on the Fair Haven & Westville Railroad, which includes the consolidated street railroad system of New Haven. The option, which covers twenty days, allows the United Gas Improvement Company the right to buy the road at $51 per share. In round numbers the road will cost the syndicate $7,000,000.

For more than a year the syndicate has been striving for an opening toward the acquisition of the road. It is needed, it is said, to obtain control of the entire trolley road system of Connecticut and to eventually perfect a trolley line from New York to Boston.

When the deal for the New Haven lines is consummated the trust will own Connecticut trolley property valued at $100,000,000. President Dolan, of the trust, a Philadelphia capitalist, is very active in completing the deal.

Exports of Electrical Material from New York.

The following are the exports of electrical material from the port of New York, for the week ended December 19:

Antwerp, 38 packages, $737; Amsterdam, 2 packages, $10; Australia, 15 packages, $1,014; Barcelona, 13 packages $1,230; Brazil, 24 packages $913; British East Indies, 8 cases, $302; Bristol, 1 case, $104; Central America, 49 packages, $3,056; Cuba, 28 packages, $599; Dutch East Indies, 2 cases, $57; Dutch West Indies, 3 packages, $76; Geneva, 85 packages, $910; Genoa, 335 packages, $29,098; Glasgow, 7,654 packages electrical cables and supplies, $16,084; 53 packages, $9,451; Hamburg, 27 packages, $3,031; Havre, 37 packages, $297; 1 case motors, $4,075; 27 cases, $10,000; Hong-Kong, 95 packages, $12,247; Japan, 81 packages, $9,621; 29 cases, $10,472; 37 packages motors, $4,849, Korea, 9 cases, $524; 14 packages, $6,440; Liverpool, 74 cases, $11,556; London, 343 packages, $24,195; 5 locomobiles, $1,250; Manchester, 47 packages, $7,300; Marseilles, 11 packages., $1,652; Mexico, 31 packages, $655; Milan, 3 cases, $200; Naples, 38, cases, $600; Newcastle, 22 packages, $2,000; New Zealand, 7 packages, $75; Philippines, 73 packages, $8,160; Santo Domingo, 236 packages, $1,541; Southampton, 69 packages, $4,397; St. Petersburg, 1 package, $150; Tasmania, 5 cases, $26; Venezuela, 54 cases, $3,761.

PERSONAL MENTION.

Mr. Homer Anderson, electrician of Peekskill, N. Y., has received a communication from F. E. Drake, Director of Machinery and Electricity at the Paris Exposition from the United States, informing Mr. Anderson that his exhibit of hand electro-magnet winders received an honorable mention.

Mr. D. H. Louderbach, who represented Charles T. Yerkes in the purchase of the franchise for running an electric underground railroad in London, returned to this city last week.

Mr. B. P. Gay, postmaster of Smithfield, Va., recently began his duties as secretary-treasurer of the Isle of Wight Telegraph & Telephone Company, succeeding J. Waverly Thomas.

INCORPORATIONS.

The F. L. Smith Electric Company, Harvard, Ill.—to furnish light, heat and power. Capital stock, $10,000. Incorporators: F. L. Smith, E. B. Smith and L. H. Smith, all of Harvard.

The Thorntown Electric Light Company, Thorntown, Ind.—to manufacture and generate electricity. Capital stock, $15,000. Incorporators: A. N. Hodgen, R. A. Asche, R. Bamberger, all of Thorntown.

The Sierra Electric Power Company, Pierre, S. D. Capital stock, $750,000. Incorporators: Anthony P. Morris, Hiram G. Tarr and T. P. Estes.

The Marine Manufacturing Company, Camden, N. J.—to deal in electrical and mechanical engineers. Capital stock, $200,000. Incorporators: R. C. Ellis, E. F. Glenn and R. I. McKinstry.

The Monticello, Fallsburg & Wahite Lake Railroad Company, Monticello, N. Y.—to construct and operate electric railroads. Capital stock, $250,000: Incorporators: T. R. Du Bois, J. C. McGuire, F. X. Keiling, J. L. Sommer, all of Newark, N. J.; J. H. Wanamaker, Brooklyn; C. M. Fuller, Jeffersonville; L. Hausser, Harrison, N. J.; J. R. McParlan, New York City, and J. C. Terbell, Liberty.

The Citizens' Gas & Electric Company, Council Bluffs, Ia.—to do a general gas and electric light business. Capital stock, $150,000. Incorporators: C. W. Perkins, E. J. Dudley, L. B. Dailey, K. K. McLaren, L. A. Kapebyea and H. W. Meen, all of Jersey City, N. J.

The Dubinski Electric Works, San Antonio, Tex. Capital stock, $5,000. Incorporators: L. Kaufman, Ed Noagelin and M. Milgrom.

The Boyce Ice Water & Electric Power Company, Jersey City, N. J.—to deal in ice and electric power. Capital stock, $100,000. Incorporators: R. M. Wiers and I. C. Edgcomb, both of Jersey City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED DECEMBER 18, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

664,096. Electric-Railway System. William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 31, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

663,981, Electric-Lighting Appliance. Arthur Peters, Manitou, Col. Filed Nov. 11, 1899.

664,083. Clutch for Electric-Arc Lamps. Charles E. Harthan, Lynn, Mass., assignor to the General Electric Company of New York. Filed March 10, 1899.

664,209. Electric-Arc Lamp. James A Brennan, Worcester, Mass. Filed Sept. 11, 1897.

664,222. Cover or Shade for Incandescent Lamps. William R. Krumwiede, Providence, R. I. Filed March 1, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

664,061. Electric Switch. Charles W. Scott, Lynchburg, Va. Filed Aug. 16, 1900.

664,077. Operating Dynamo-Electric Machines. William L. R. Emmet, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed June 29, 1900.

664,080. Motor-Switch. Henry Geisenhoner, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 4, 1899.

664,086. Regulator for Electrically-Actuated Air-Compressors. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York Filed Nov. 7, 1898.

664,087. Automatic Rheostat. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Nov. 7, 1898.

664,092. Electricity-Meter. William M. Mordey and Guy C. Fricker, London, Eng. Filed Oct. 10, 1900.

664,190. Alternating-Current Electric Motor. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Aug. 19, 1897.

664,191. Call-Register or Service-Meter Circuit for Switchboard Apparatus. George K. Thompson, Malden, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Oct. 8, 1900.

664,195. Controller-Switch. Noble Vance. Chicago, Ill., assignor to the Hewitt Lindstrom Motor Company, same place. Filed July 23, 1900.

664,247. Dynamo-Electric Machine. Justus B. Entz, Philadelphia, Pa., assignor of one-half to Guy F. Greenwood, Allegheny, Pa. Filed Nov. 27, 1897.

664,265. Electric Meter. Edward S. Halsey, Chicago, Ill. Filed July 5, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

663,998. Germ-Destroyer for Telephone-Mouthpieces. Lewis L. Lacey, Austin, Tex. Filed April 20, 1900.

664,346. Telephone-Call Register. William H. Barker, Hartford, Conn., assignor to the Gray Telephone Pay Station Company, same place. Filed Aug. 10, 1898.

MISCELLANEOUS.

663,859. Receiver for Printing-Telegraphs. John Burry New York City. Filed Aug. 18, 1896.

663,903. Telegraphic Instrument. Harry T. Johnson, Jersey City, N. J. Filed Feb. 26, 1900.

663,926. Auxiliary Attachment for Signal-Boxes. Bartholomew Oehmen, New York City, assignor to the Gamewell Fire Alarm Telegraph Company, same place. Filed May 22, 1900.

663,929. System for Heating Conductors of the Second Class. Carl D. Raab, Kaiserslautern, Germany. Filed April 30, 1900.

663,937. Primary Battery. Charles B. Schoenmehl, Waterbury, Conn., assignor to the Waterbury Battery Company, same place. Filed Feb. 27, 1900.

663,938-664,006-664,007-664,008. Galvanic Battery. Charles B. Schoenmehl, Waterbury, Conn., assignor to the Waterbury Battery Company, same place. Filed March 22, 1900, June 12, 1900, Aug. 21, 1900.

663,951. System of Motor Control. Albert H. Armstrong, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 6, 1900.

664,004. Electrical Piano. Stephen K. Reynolds, New York City, assignor of one half to Frank W. Chamberlin, same place. Filed June 10, 1899. Renewed May 17, 1900.

664,023. Electric Accumulator. Pascal Marino, Brussels, Belgium. Filed June 23, 1899.

664,046. System of Non-Interchangeable Contact Parts. Rudolf Hundhausen, Wilmersdorf, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Nov. 4, 1899.

664,081. Electrical Heating Apparatus. Carl Gohlin, New York City. Filed July 26, 1900.

664,105-664,106. System of Electrical Distribution. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 20, 1900, Aug. 30, 1900.

664,135. Electric Sweeper and Dust-Gatherer. Corinne Dufour, Savannah, Ga. Filed July 31, 1900.

664,144. Electrical Connection. William Gerhardt, Hazleton, Pa. Filed Sept. 27, 1900.

664,163. Combined Automatic Gas-Light Extinguisher and Electric Sparker. Gustav H. Lippmann, Milwaukee, Wis. Filed March 20. 1900.

664,176. Electric Insulator. Emil Risler, Freiburg, Germany. Filed July 25, 1900.

664,189. Electrical-Switch Cap. George B. Thomas, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, same place. Filed Aug. 27, 1900.

664,198. Secondary Battery. Frank W. Wetherill, Philadelphia, Pa., assignor of three-fourths to William S. Kirk and W. Stokes Kirk, same place. Filed Feb. 4, 1899.

664,219. Commutator. Fritz Kaeferle, Hanover, Germany. Filed Sept. 15, 1900.

664,301. Insulator. Richard H. Sterling, Pittsfield, Mass., assignor to the Stanley Electric Manufacturing Company, same place. Filed March 14, 1900.

664,308. Electrotherapeutic Spectacles. Thomas B. Zeller, Pittsburg, Pa., assignor of one-half to Franklin B. Saylor, same place. Filed Oct. 29, 1900.

664,334. Manufacture of Carbid of Calcium. John M. Morehead, Chicago, Ill., assignor to the Union Carbide Company, same place. Filed Dec. 12, 1899.

664,348. Electric Clock. Ulysses L. Collins, St. Louis, Mo. Filed Nov. 20, 1899.

664,360. Igniter for Gas or Oil Engines. Albert T. Otto, New York City. Original application filed Dec. 26, 1896. Divided and this application filed May 19, 1899.

664,362. Galvanic Battery. Eason L. Slocum, Pawtucket, R. I. Filed March 7, 1896.

664,366. Fire-Alarm-Telegraph Box. Leonidas G. Woolley, Kenton, O., assignor to the National Magneto Electric Telegraph Company, Springfield, O. Filed Dec. 28, 1899.

664,367, Electric-Circuit Indicator. Leonidas G. Woolley, Kenton, O., assignor to the National Magneto Electric Telegraph Company, Springfield, O. Filed Dec. 28, 1899.

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THE TELEPHONE WORLD.

Bell Telephone Company Wins $12,000,000 Suit.

Justice Colt, in the United States Circuit Court of Boston, Mass., on December 21, decided in favor of the American Bell Telephone Company in the royalty suit brought by the Western Union Telegraph Company.

The case is known as the Stock Ticket Case. The Western Union sought to recoover $12,000,000 royalties under a contract between it and the National Bell Telephone Company, the defendant's predecessor, made on November 10, 1879.

The case has been before the courts since 1883, and was based upon a claim of 20 per cent. of the profits received by the defendant in return for the telephone business of the Western Union Company.

It is stated that the New England Telephone & Telegraph Company has not yet been able to get its lines repaired from the damage caused by the recent storm in some sections of Vermont. The systems are, of course, in good working order, except through new wires and new connections, and it may be weeks before the lines that were damaged, and in many cases destroyed, can be repaired. In Rutland where the greatest damage in that State was done, the trouble has been mostly repaired. In some places the ice around the wires had a circumference of 4 or 5 inches, and this immense weight broke down the poles to such an extent that the lines will have to be rebuilt for several miles in different places. At Newport, N. H., the trouble was worse than at Rutland and the ice still holds the wires there, while at Rutland it has dropped away. It will require several weeks and cost several thousand dollars to make good the damage.

City Attorney Pollard, of Richmond, Va., recently served a notice on the city council that he would, on the second Monday in January, file a petition before the United States Supreme Court to either send back to the United States Circuit Court of Appeals at Richmond the case of the city of Richmond vs. the Southern Bell Telephone Company to force the company to get off the city's streets, or to affirm the decision of the lower court, which was against the company. The case has been in litigation several years, and the lower court decided against the company. If the lower court decision is affirmed the city council will take steps at once to remove all the poles and wires of the company from the streets.

Two new telephone lines from Express, Ore., into the interior will be in operation shortly. The Pacific States Telephone Company is building a branch line from Express to the Gold Hill mines, a distance of six miles. The poles are about all up, and wires are strung from this end of the line. Construction of a private line through Burnt River Valley for the benefit of the ranchers is in progress. Five have already secured service, and every rancher in the valley is taking an interest in the system, and will likely become patrons.

Telephoning without wires was successfully accomplished in Minneapolis, Minn., recently, by transmitting the voice across the Mississippi River near the Franklin avenue bridge, a distance of over 1,000 feet—one and fifty feet of copper wire was strung in parallel lines on either side of the river. The first experiment was tried with five volts. Words could be as distinctly understood as over the regulation wire telephone. Other batteries were then attached, five at a time, finally cutting in twenty volts on one end of the line, with five on the other. The operator at the five end could not only understand what was being said to him, but could hear others talking on the bank of the river near the transmitter.

O. H. Harrell has brought suit against the Northwestern Telephone Company in St. Paul for $50,000 damages. He was in a hole 9 feet deep, in obedience to orders, when the side caved in almost completely burying him. He alleges that he received injuries which will permanently disable him.

The school committee of Somerville, Mass., lately voted to install a telephone system, connecting the different school buildings with the superintendent's office.

The Forman, N. D., Telephone Company has raised its rates to $2 per month for 'phones in business houses, and as a consequence considerable dissatisfaction is expressed by patrons.

The telephone lines of Richmond, Ky., have been purchased by the Cumberland Telephone Company, and made a part of the system.

Independent Franchise Considered in Michigan.

In view of the increasing restrictions upon the use of the telephones in Detroit the members of the common council ommittee on franchises are exhibiting a disposition to most seriously consider the propositions of J. W. Martin, who recently made a request in the council for a franchise for an independent system. Chairman Smith of the committee, Aldermen Beamer, Marx and Lemke, who are particularly incensed at the attitude of the Bell Company, and Alderman-elect Weber, at the invitation of Martin, recently made a trip of inspection to Pontiac, Mich., where a 700-subscriber exchange has just been completed.

"There is every reason," said Mr. Smith, "why the matter of a new telephone company should be prominently and seriously brought before the public. Martin has a good proposition and I am convinced he is able to carry it out. Of course we must protect the city from the possibility of a consolidation if a new company is authorized in the field, but I am assured that there are ways to prevent a repetition of such a consolidation of interests as has come to pass between the Bell and the Detroit Companies. I propose to determine just how this can be done, if this is a fact, and then bring Martin's proposition squarely before the council."

Mr. Smith, it is said, is in receipt of hundreds of letters from citizens of Detroit and outside towns reciting grievances against the Bell combination and urging the council to give a new franchise to anybody who exhibits a serious intention of alleviating the present unbearable conditions.

Independent Company Wins in Ohio.

The city council of Alliance, O., at a recent special session passed an ordinance granting a franchise to the Stark County Telephone Company, a branch of the United States Telephone Company. This is looked upon as the end of the bitter war that for ten months has been waged between the Bell and independent companies in the effort of the former to keep the latter from gaining a footing there.

Three different franchises were knocked out on technicalities by the council and the courts.

At a recent meeting af the directors of the Weakley County Telephone Company of Martin, Tenn., R. W. Martin and J. M. Gardner were appointed supervisors of the entire system, which embraces four exchanges—Martin, Dresden, Gleason and Mt. Pelia, Tenn. A number of changes have been made in the system, one of which was installing a new switchboard at Dresden, which is working nicely. The list of subscribers is constantly increasing, there being nearly 200 in Martin. The company has a bright prospect for much success in the future.

The Missouri & Kansas Telephone Company announces a cut in rates, effective January 1. The Churchill-Craddock Company of St. Louis, Mo., is putting in a system there, and is expected to be ready for business the first of the year, hence the cut. The rate has heretofore been $3 for business houses and $2.50 for residences per month. In future the rate to residences will be $1.50.

E. L. Bailey, of the Dundee, N. Y., Electric Light Company, has completed a telephone line between Dundee village and the hamlets of Starkey and Eddytown, N. Y. The line will prove to be a great convenience. Mr. Bailey is preparing to establish a telephone exchange in Dundee, and expects to secure all the business places and a goodly portion of the residences.

W. H. G. Butler, for several years past manager and chief stockholder of the Citizens' Telephone Company at Columbus, Ind., a branch of the Harrison Company, has sold his stock to S. P. Sheerin, of Indianapolis, and will move to some point in Illinois and establish a local company. Max Hosea, chief lineman, will succeed him as manager.

From Glenwood Springs, Col., comes the information that the Colorado Telephone Company has connected up its line, making a complete circuit from Denver, Leadville, Aspen, Glenwood, Grand Junction, Montrose, Ouray and Silverton, Col., with all the intermediate points. This means a circuit of over 500 miles.

The Newark, O., Independent Telephone Company, which recently secured connection with the new exchange at Columbus, has arranged to connect with 172 miles of toll lines in Muskingum, Holmes and Coshocton Counties of that State, and the exchanges at Frazeysburg, Warsaw and Bloomfield.

The Hatboro, Pa., borough council has passed an ordinance permitting the Interstate Telephone Company to erect wires in the town.

'Phone Company of Massachusetts Open for Business.

The Massachusetts Telephone Company has completed practically all the preliminary work incidental to the opening of an independent telephone service in Boston and last week commenced as an operating company. The cables have been completed and connected, the switchboard set up and the operators engaged to answer the calls of 6,000 subscribers. The main office of the company, at No. 185 Franklin street, Boston, was lately put in touch with its subscribers within a block of the old New England Telephone Building in Franklin street, and hardly more than that from the present building of the American Bell Telephone Company, or as it now is called the American Telephone, Telegraph & Cable Company.

The new company occupies two floors. The lower floor is for the executive offices, which are nicely fitted, and upstairs is the main operating room. The management has secured the lease of the upper floor for the convenience of the operators.

The switchboard, built by the Stromberg-Carlson Company, has a capacity of 1,800 lines. The Stromberg-Carlson central battery system, which is used, does away with the necessity for batteries at the subscribers, end of the line, all of the batteries being in the main office.

Direct connection is made with the cables and ducts.

The company now covers the business and financial centers of Boston, over 800 miles of copper wire having been laid, and the ducts are in every street in the business center and are capable of enlargement.

Long-distance telephonic communication between this city and Philadelphia was resumed last Friday. There was a break in the service Thursday night, and searchers who went looking for the causes of the trouble found that thieves had cut and carried away whole sections of the valuable copper wire, near Linden, N. J. A section from pole to pole is worth between $60 and $80. The country about Linden is sparsely inhabited, and the thieves worked undisturbed. It is believed the thieves who stole the wire are also responsible for similar thefts in near-by towns.

John I. Sabin, president of the Pacific States Telephone Company of San Francisco, Cal., has sent a letter to Mayor Phelan, in which he threatens to remove, on December 31, 1900, all the telephones now used by the city government unless the bill for the month of November is paid. Supervisor McCarthy's agitation against paying the demands, claiming that the company owes the city for license taxes on nickel telephones, resulted in it being held up by the finance committee.

There are nearly 3,000 telephones in use in Tacoma, Wash., an increase of more than 1,000 since last January.

A telephone line from Huntington to Burns, Ore., is projected.

TELEPHONE INCORPORATIONS.

The Brazil Telephone Company, Brazil, Ind.—to operate telephone lines Capital stock, $10,000. Incorporators: A. P. Markle, F. D. Blue, P. S. Markle, all of Brazil.

The United States Telegraph & Telephone Company, Philadelphia, Pa. Capital stock, $2,000,000.

The Northern Indiana & Southern Michigan Telegraph Company, Lagrange, Ind.—to establish telephone and telegraph lines. Capital stock, $20,000. Incorporators: A. J. Hostetter, R. Ellison, A. H. Ellison, all of Lagrange.

The Mt. Pulaski Telephone & Electric Company, Mt. Pulaski, Ill,—to furnish light, heat and power. Capital stock, $5,000. Incorporators: J. W. Collins, H. S. Bakemeyer, O. M. Hubbard, all of Mt. Pulaski.

The Central Energy Telephone Company, Frankfort, Ind. —to operate telephone, lines. Capital stock, $30,000. Incorporators: J. H. Murphy, M. W. Hopkins, W. Payne, all of Indianapolis.

The Northwestern Telephone & Telegraph Company, Dover, Del.—to construct and operate telephone lines. Capital stock, $200,000. Incorporators: C. E. Milligan, A. E. Killey, E. O. Humphrey, E. L. Granel, all of Carthage, N. Y.; E. A. Laughlin, G. J. Atkins, both of Chicago, Ill.

The Harrison County Telephone Company, Cadiz, O.—to construct and operate telephone lines. Capital stock, $25,000. Incorporators: A. J. Vernier, C. O. Juvenal, J. M Schrieber, W. W. Wright, W. W. Potts, R. Cunningham.

The Farmers' Mutual Telephone Association, Mechanicsburg, O.—to operate a telephone system. Capital stock, $10,000. Incorporators: H. C. Rogers, D. J. Burnham, E. W. Patrick, A. F. Burnham, O. R. Hinton and C. W. Martin.

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GENERAL ELECTRICAL NEWS.

Lighting.

Beaver Falls, Pa.—The College Hill borough has voted to give the council power to borrow $12,000 for an electric light plant.

Blair, Wis.—The citizens have raised a fund of $2,000 to be used in putting in an electric light plant. W. G. Hyslop is at the head of the movement.

Bonham, Tex.—M. Watson of this place contemplates installing an electric light plant in the near future.

Butler, Pa.—Application will be made to the Governor on January 8 for the charter of the Schuylkill Light, Heat & Power Company to supply electric light, heat and power to the residents of Butler Township. The charter members of the company are Chas. P. Donnelly, Arthur W. Ormerod, T. D. Pitts, W. B. Griffiths and Harry B. Davis.

Chicago, Ill.—The Government is to erect an electric lighting plant at Fort Sheridan military post. A. G. McPherson of Highland Park has been engaged to prepare the plans and specifications for it.

Chickasha, I. T.—A charter was lately granted the Chickasha Water & Electric Light Company to put in a plant at this place. The capital stock is $250,000 and the incorporators are A. J. Campbell, H. B. Johnson and E. Blake.

Cottage Grove, Ore.—This city will install an electric light plant.

Ellsworth, Wis.—E. S. Willey and E. Buck have purchased the electric light plant here and it will be improved extensively.

Fairbury, Neb.—This town is negotiating for an electric light plant.

Galena, Ill.—About $18,000 will be expended on the new electric lighting plant here.

Hartington, Neb.—There is talk of purchasing an electric light plant for this place.

Knightstown, Ind.—This city is preparing to own and operate its own electric light plant in the near future.

Mangum, Okla.—Moore Mill & Gin Company of this place wants information and estimates on an electric light plant for a town of 1,200 population.

Milwaukee, Wis.—The North Milwaukee Electric Light Company has been incorporated by A. D. Meiselbach, Otto Brandis and John H. Hurley, to take charge of the electric lighting business in that village. The capital stock is $15,000.

Minneapolis, Minn.—A change in the method of computing charges for electric light in this city has been announced, which amounts to a reduction of 33⅓ per cent. to people who use their lights longer than one hour a day.

Nashville, Tenn.—This city will want bids next spring on a plant of 400 2,000 candle power arc and 5,000 incandescent lamps to cost not more than $150,000. Address J. M. Head, mayor.

Norman, Okla.—At the next meeting of the city council Hon. J. C. Walls and F. Essex will make a proposition to put in an electric light plant.

Oquawka, Ill.—The Oquawka Button Company is thinking of putting in an electric light plant.

Philadelphia, Pa.—The director of public safety has announced the award of the bids for public electric lighting for 1901 to the Brush Electric Company.

Pittsfield, Ill.—There is talk of a new incandescent electric light plant in this city. Local capitalists are figuring on organizing a stock company to put in an entirely new outfit.

Richmond, O.—The contract for the new municipal electric light plant here will be let January 3, and the construction of the same will be commenced at once.

Saybrook, Ill.—The citizens of this place contemplate the erection of an electric light plant.

Scranton, Miss.—J. Summersgill of this place wants a small electric light plant complete.

Southboro, Mass.—This place is to have electric lights in the near future.

Springfield, Mass.—The Hill shops of the armory are soon to be equipped with a new and larger dynamo for the purpose of lighting the grounds and all the buildings with electricity. With the exception of the milling department, all the Hill shops are now equipped with electric light.

Stamford, Conn.—The citizens here are contemplating the erection of a municipal electric lighting plant.

Stella, Neb.—A stock company has been organized among the local business men for the purpose of establishing an electric light plant.

Tiskilwa, Ill.—The citizens here are agitating the question of erecting an electric light plant.

Trenton, N. J.—Articles of consolidation were filed last week merging several electric light companies in the northern part of this State into the Central Electric Company, whose capital stock is increased from $100,000 to $750,000.

Two Rivers, Wis.—J. P. Miller has applied to the city council for a franchise to erect an electric light plant here.

Warren, Ill.—Plans are being formulated to erect an electric light plant in this town, to cost about $10,000.

Waterbury, Conn.—The citizens of this place have decided to take steps to petition the Legislature for permission to bond the city to the amount of $100,000 for the purpose of going into the business of municipal electric lighting.

White Pigeon, Mich.—The citizens of this place want electric street lights and a company of promoters is desirous of establishing a plant to furnish such service, but as yet the two have been unable to agree on the price.

Street Railways.

Beaver Falls, Pa.—The route of the new electric street railway, connecting this place with New Castle, was recently gone over by J. C. Whitta and Dr. T. P. Sampson of Beaver Falls. Work will be begun on the building of the new line early in the spring, and contracts for material are now being made.

Chattanooga, Tenn.—C. P. King and J. H. Jeffries, of Philadelphia, have been here to reorganize three rapid transit companies in which they have invested largely. The new company will control electric lines to Chickamauga Park, 10 miles from this city, to all suburbs at the base of Mission Ridge, to the heights north of Chattanooga, across the Tennessee River.

Dover, Del.—Delaware's State capital will soon be connected with Wilmington, Del., and Philadelphia by trolley.

Elkton, Md.—It has been decided to construct at once the proposed electric road in Cecil County between here and Chesapeake City. The cost will be $126,400, and the length about eight miles.

Greencastle, Ind.—The county commissioners have granted a franchise to W. B. Vestal and others to operate electric lines on the principal thoroughfares in Putnam County. It is probable that an east and west line will be built within a short time.

High Point, N. C.—The Winston Electric Company contemplates extending the line from Winston and Waughtown to this place. Applications for a charter for such extension will be made to the next General Assembly.

La Porte, Ind.—L. B. Bradley, representing Chicago capitalists, was granted a franchise here for the immediate construction of an electric railroad to connect La Porte and Michigan City.

Litchfield, Ill.—O. W. Atterbury of this place, proposes to build an electric road from here to Hillsboro. The Montgomery County board has granted a franchise.

Manchester, Va.—Capitalist Townsend of St. Louis, Mo., backed by St. Louis capital, has completed plans to construct an electric line between here and Petersburg, a distance of 21 miles.

Natchez, Miss.—The Natchez Electric Street Railway & Power Company has been chartered with $150,000 capital stock by A. G. Campbell, Capt. J. W. Lambert and T. Reber.

Newburgh, N. Y.—There is a movement on foot to have a trolley road run from here to connect with the New Paltz road.

Norfolk, Va.—The Bay Shore Company is being organized by H. L. Page to build an electric line from this city to Ocean View.

Paw Paw, Mich.—The Kalamazoo Valley Traction Company has been granted a franchise for an electric railway through this village. The proposed road will be part of an electric system from Detroit to Benton Harbor. Attorney Palmer of Detroit, is working up the matter on behalf of the company.

Pittsburg, Pa.—It is reported that a deal will be closed to-day at the office of the McKeesport & Youghiogheny Traction Company in this city, in which 100 towns, taking in 600,000 people, will be brought into closer touch with each other. The line will be 118 miles in length and will furnish direct communication between Pittsburg, Uniontown and Connellsville.

Rome, Ga.—The proposed extension of the city electric railway to Lindale will be about five miles in length and it is estimated will cost $25,000.

Smyrna, Del.—The project of running a trolley line down the State from Delaware City via Odessa, through Thoroughfare Neck to this place is again revived. Harry A. Richardson, Peter J. Ford, Peter L. Cooper and others are the promoters of the scheme.

Sullivan, Ind.—The commissioners of this place are considering applications for electric railway franchises covering 200 miles.

Manufacturing.

Chicago, Ill.—The General Pneumatic Company of this city has recently been formed with a capital of $25,000 for the purpose of manufacturing power, electricity, vehicles, motors, etc. Peter W. Thede, Frederick Gehn and Thomas P. Kerrigan are all interested in the concern.

Garwood, Pa.—The American Machinery & Export Company of this place was lately incorporated in Trenton, N. J., and will manufacture railroad, electric light and telephone equipments on a capital of $250,000. E. A. Simmons, W. B. Smith, both of Garwood; J. P. Powers, of Elizabeth, are among the interested parties.

Syracuse, N. Y.—The Crouse-Hinds Company, manufacturers of electrical supplies, will remove to new quarters on Jefferson street about January 1. Considerable new machinery will be purchased when the building is ready for the occupancy.

Wilmington, Del.—A large order has been closed with the Sprague Electric Company for 20 horse power motors of the slow speed direct connected type to operate the new plant of the Delaware Button Company in this city.—The Clarke Electro Company was organized here last week, for the purpose of manufacturing and dealing in medical electrical appliances.

Company Matters.

Cleveland, O.—The plant of the Brown Hoisting & Conveying Company and that of the Elwell-Parker Electric Company, were totally destroyed by fire last week, with a loss of nearly $1,000,000.

Pittsburg, Pa.—The contract for the wiring and electric fixtures for the new Union station has been awarded by the Pennsylvania Railroad Company to Carter & Fullman of this city for about $50,000.

Automobiles.

New Albany, Ind.—The Louisville Automobile Cab Company of this place will operate a cab and transfer service.

Newark, N. J.—The Thompson Automobile Company filed articles of incorporation with the county clerk lately. The purpose is set forth to be the manufacture of all kinds of automobiles. The capitalization is placed at $250,000. The principal office of the company will be at 810 Broad street, this city. J. C. Bleveney and C. F. McGuire, of this city, and J. S. W. Thompson, of Morristown, are named as incorporators.

Wilkes-Barre, Pa.—The electric busses have proven such a success that the company has ordered three others for use in various parts of the town. Posten Brothers also have one that they use between the depots and the hotels.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Dec 22						
United Traction	100	$5,000,000	$5,000,000	1¾ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Dec 22						
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Dec 22:						
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Dec 22:						
a United Rail ways & Elec. Co...com.	50	24,000,000	13,000,000	....	18½	18¾
Boston, Mass.—Dec 22						
New England Street Ry	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,00	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	113
Boston Elevated R. R.	100	10,000,000		2¼ % Aug. 99,	156	157
Brooklyn N. Y.—Dec 22:						
Brooklyn City Ry	100	2,000,000	1,928,400	....	230	233
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	43,000,000	....	83¾	84
*c*Brooklyn Heights Railroad	....	200,000	200,000	....	107	109
* *d*Brooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	237	239
*e*Brooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
*f*Atlantic Avenue Railroad	50	2,000,000	2,000,000	....	--	--
*g*Brooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Dec 22.						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co	100	6,000,000	5,370,500	1 % Q. Dec., '99.	99	100
Columbus O.—Dec 22						
Columbus Street Railroad	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	....	90	91
Charleston, S. C.—Dec 22						
Charleston City Ry. Co	50	100,000	100,000	3 % S.	--	--
Enterprise City RR. Co	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Dec 22						
Chicago City Ry. Co	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	253	255
Chicago & South Side R. T. RR	100	10,328,800	10,328,800	....	..	..
Lake Street Elevated RR	100	10,000,000	10,000,000	....	9½	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	31¼	32
Met. West Side El., pfd	100	15,000,000	9,000,000	....	83½	88¾
North Chicago Street RR	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
*h*North Chicago City RR	100	500,000	249,900	....	197	200
South Chicago City Railway	100	2,000,000	1,608,200	....	99½	100
West Chicago St. RR. Co	100	20,000,000	18,189,000	1½ % Q., Feb.	98	98½
Union Traction Ry.............com.	....	1,250,000	624,900	35 %	11	12
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	44	45
Cincinnati, Ohio.—Dec 22:						
Cincinnati Inc. Plane Ry.......com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry........pfd.	50	150,000	150,000	½ % Feb.	..	..
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
*i*Cincinnati Street Ry. Co	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126¼	127
Cleveland, Ohio.—Dec 22:						
Akron, Bed. & Clev. Elec. Ry	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Dec 22:						
Detroit Citizens' Street Ry	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry	100	....	1,200,000	....	175	..
Rapid Railway Co	....	250,000	250,000	....	90	100
Detroit Electric Railway	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry	100	250,000	200,000	....	100	110
Dayton O.—Dec 22:						
City Railway Co...............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co...............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway	....	1,100,000	1,100,000	....	114	115
Hartford Conn.—Dec 22						
Hartford Street Ry. Co	100	$4,000,000	$200,000	8 % S., Oct.,	150	--
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	--
Holyoke Mass.—Dec 22						
Holyoke Street Ry. Co	100	400,000	400,000	8 % A., June,	207½	212
Hoboken N. J.—Dec 22						
North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %,	150	--
Indianapolis, Ind—Dce 22						
**Indianapolis Street Ry	....	5,000,000	5,000,000	....	27	29
Lancaster, Pa.—Dec 22						
Pennsylvania Traction Co	100	10,000,000	9,900,000	....	--	--
Lancaster & Col. Electric Ry	....	....	87,500	....	--	--
West End Street Railway	....	....	....	....	--	--
Louisville, Ky.—Dec 22:						
Louisville Ry..................com.	100	4,000,000	3,500,000	1¼ %., April.	82	83
Louisville Ry..................pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Minneapolis, Minn.—Dec 22						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅝	68⅞
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	136	137
Montreal, Canada.—Dec 22						
Montreal Street Ry. Co	50	4,000,000	4,000,000	8 % S., M. & N.	271	273
Toronto Street Ry. Co	100	6,000.000	6,000,000	1¾ % S., J. & J. †	107½	107¾
Memphis Tenn.—Dec 22:						
Memphis Street Railway Co	100	500,000	500,000	....	25	--
New Haven, Conn.—Dec 22:						
Fair Haven & Westville RR	25	2,000,000	2,000,000	8 % S., Sept.	39	41
New Haven Street Railway Co	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville	100	700,000	800,000	....	..	--
Winchester Avenue RR	25	1,000,000	600,000	....	45	46
New Orleans, La.—Dec 22						
Canal & Claiborne RR. Co	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
*a*Crescent City RR..........guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
*b*New Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Dec 22:						
Central Crosstown RR	100	600,000	600,000	2½ % Q.	255	300
*c*Christopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
*d*Metropolitan Street Ry. Co	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	174¼	174½
*e*Bleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
*f*Broadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
*g*Cen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
*h*Eighth Avenue RR	100	1,000,000	1,000,000	....	390	405
*i*42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
*j*Ninth Avenue RR..........guar.	100	800,000	800,000	....	198	201
*k*Sixth Avenue RR...........guar	100	2,000,000	2,000,000	....	205	225
*l*Twenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	117	117¾
*m*42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Dec 22:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	60¾	61
North Jersey Railway Co	100	6,000,000	6,000,000	....	24½	25½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	23	24
Pittsburg, Pa.—Dec 22:						
Allegheny Traction Co	50	500,000	500,000	....	27	58
*o*Consolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	27¾	28
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	64½	65
*p*Central Traction Co	50	1,500,000	‖900,000	1½ % Nov.	72½	73
*q*Citizens' Traction Co	50	3,000,000	‡3.00	6 % A.	72¼	72½
*r*Duquesne Traction Co	50	3,000,000	‡3,00	6 % A.	--	...
*s*Pittsburg Traction Co	50	2,500,000	1,90	3½ %, Nov.	- ½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry	50	3,000,000		5 % A., June	..	..
United Traction Co..............com.	50	17,000,000		J. & J.	15	15½
United Traction Co..............pref	50	3,000,000		J. & J.	50¾	51

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R.& Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $625,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,000,000 stock guaranted by West Chicago Street Railway Company, lessee.

incinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Dec 22						
Union Street Railway Co	100	$350,000	$350,000	2 %, Feb.	160	165
Northampton, Mass—Dec 22						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	178
Omaha, Neb.—Dec 22						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Dec 22						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	—
Providence R. I.—Dec 22						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98	109	111
Philadelphia.—Dec 22						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,936,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	533,900	‡533,900	3 % S—July, '99.	75	76
*a*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co.......... $12½ pd	50	30,000 000	29,930,450	....	36⅞	37
*c*Electric Traction Co	50	....	8,297,920	....	..	...
*d*Citizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
*e*Frankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
*f*Lehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
*f*Lombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
*d*Second & Third Streets Ry	50	1,060,000	†771,076	$9 share A, Mar. 98	300	...
*e*People's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
*g*Germantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
*g*Green & Coates Passenger Ry.	50	500,000	‖150,000	3 % Jan., 1898.	151	152
*h*People's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
*h*People's Passenger Ry....pfd.	...	750,000	‖277,402	....	...	...
*i*Philadelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
*j*Catherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
*j*Continental Pass. Ry.....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co	50	600,000	‖600,000	....	...	..
*j*Philadelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
*j*Philadelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
*j*Ridge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
*j*Philadelphia & Darby Ry.guar.	50	....	‖200,000	$2 share July, '98.	...	..
*j*17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
*j*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖835,000	$11 sh. A., July, '98	300	..
*j*Union Passenger Ry. Co	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
*j*West Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	268
Rochester, N. Y.—Dec 22						
Rochester Railway Co	100	5,000,000	5,000,000	....	20	23
Reading, Pa.—Dec 22						
*j*Reading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
*k*City Passenger Ry	50	850,000	850,000	Jan., '98.	138	...
*l*East Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	—
St. Louis Mo.—Dec 22						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	—	..
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	—	..
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	..	..
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	..	..
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	..	..
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	..	..
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	..
Missouri RR	50	2,400,000	2,300,000	1½ % Jan., '99.	..	..
People's RR. Co	50	1,000,000	800,000	50c., Dec., '89.	..	..
United Electric Ry.........com.	50	500,000	500,000	....	19	20
United Electric Ry........6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	63	65
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99.	..	..
San Francisco, Cal.—Dec.						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68½
Presidio & Ferries RR	100	1,000,000	550,000	....	—	16
Scranton Pa—Dec 22						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
*m*Scranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
*m*Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	—	..
Springfield Ill.—Dec 22						
Springfield Consolidated Ry	100	750,000	750,000	....	—	—
Springfield O.—Dec 22						
Springfield Street Ry	100	1,000,000	1,000,000	....	—	11
Springfield, Mass.—Dec 22						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Dec 22						
Toronto Street Ry	100	6,090,000	6,000,000	1¾ % S.	‖108¼	109
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	272¾	273
Washington, D. C.—Dec 22						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	—	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	—	..
Worcester, Mass.—Dec 22						
*Worcester Traction Co.......com.	100	8,000,000	8,000,000	....	81¼	84
Worcester Traction Co......6 % pfd.	100	2,000,000	2,000,000	3 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Dec 22						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

jj Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 22						
American Tel & Tel Co	100	50,000,000	28,650,000	4½ % Q., Jan.	155	157
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	100	102
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	127½	128
New York.—Dec 22						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	170	175
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co.guar 6 %	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		8	8⅛
*New York & New Jersey Tel. Co	100	5,000,000	3,728,000	2½ % Q., Jan.,	165	170
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	83¼	88½
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Dec 22						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,561,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co	100	......	......	....	67	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2½ % Q.	122	125
Providence (R. I.) Teleph. Co	50	......	......	....	96½	97
Southern New Eng. Teleph. Co	100	8,000,000	......	....	...	..

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 22						
Fort Wayne Electric trust receipts	..	......	......	....	115	126
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	..
General Electric Co. [new]...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	196	196⅛
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	52½	54
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,058	1¾ % Q., Jan.,	64	65
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Dec 22						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	—	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co.........com.	..	......	......	....	—	..
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	195	196¼
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	—
‖ Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Dec 22						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	—	—
Philadelphia, Pa.—Dec 22						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	80	84
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	88	90
Northern Elec. Light & Power Co	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co	10	187,500	187,500	....	20	—
Miscellaneous.—Dec 22						
Bridgeport (Conn.) Elec. Lt. Co	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co	100	850,000	......	....	175	176
Hartford (Conn.) Lt. & Power Co	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98½	99
Rhode Island Elec. Protec. Co	100	......	......	....	118¼	120¼
Royal Elec. Co. (Montreal)	..	1,000,000	.....	2% Q	‡206¼	208
Toronto (Canada) Elec. Light Co	100	1,085,000	1,085,000	1¾ % Q	133¼	135
Thomson-Houston Welding Co	100	......	......	8 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co	100	......	......	....	106	108

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME.	Par	Capital Stock. Authors'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Dec 22						
American Electric Heating Co	50	10,000,000	....	.....	—	—
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	—	—
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	—	100
New York.—Dec 22						
Consolidated Electric Storage Co	...	......	....	....	8	12
Safety Car Heating & Lighting Co	100	......	....	......	150	155
Worthington Pump Co.......com.	100	5,500,000	5,500,000	......	..	—
Worthington Pump Co.........pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Dec 22						
Electro Pneumatic Trans. Co	10	1,500,000	......	——	3	8½
United Gas Improvement Co..scrip.	50	10,000,000	......	——	..	102
Welsbach Commercial Co.....com.	100	8,500,000	......	——	20½	21½
Welsbach Commercial Co......pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	43½
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Dec 22						
Carborundum Mfg. Co	100	200,000	200,000	....	—	..
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	209	210
Miscellaneous.—Dec 22						
*Barney & Smith Car Co......com.	100	......	1,000,000	——	13	16
*Barney & Smith Car Co.......pfd.	100	......	2,500,000	2 %	94	96
Billings & Spencer Co	25	......	......	....	32	..
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co	100	....	....	——	105	109
*Pratt & Whitney Co..........com.	100	......	....	——	2	4
*Pratt & Whitney Co............pfd	100	....	......	——	40	50
Stillwell-Bierce Co............com.	..	....	....	——	—	50
Stillwell-Bierce Co.............pfd.	..	....	....	2 % Sept 1,'99.	50	65
Shultz Belting Co	100	500,000	....	....	80	90
St. Charles Car Co	—	....	....	......	80	105

*Unlisted.

BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Dec 22, 1900

NAME.	Amount. Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117 1/8	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	375,000	1947	M. & N.	*116 1/8	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	350,000	350,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	......
Troy City Railway Co..................1st 5s	....	....	1942	......	*116 1/2	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102 1/4
" " " ....income 4s.	14,000,000	....	1949	J. & D.	74 3/4	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 7/8	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104 1/8	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121 1/8
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102 1/2	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	601,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g. 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104 1/8	106
West End Street Ry........Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	... .	....
†Charleston City Ry............1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101 3/4	2 1/4
†Chicago Passenger Ry......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry...Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.............4 1/2s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry.....1st mtg 4 1/2s,	4,040,000	4,040,000	1932	J. & J.	108 1/8	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96 1/8
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry......1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	......
North Chicago City Ry.....consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR.........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106 5/8	107
§W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
§Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Dec 32, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114 1/8	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103 1/8	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108 3/4	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121 1/8	122 1/2
‖So. Cov. & Cin. St. Ry.......2d mtg. 6s.	400,000	400,000	1932	J. & J.	132 3/4	137

† Assumed by the Cincin. St. Ry. Co.
‖$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106 1/2	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113 1/2	114 1/4
Cleveland City Cable Ry....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105 1/2	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1913	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107 1/2
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102 1/2
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106 1/2

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5	100,000	24,000	1912	M & S	......	....

New Orleans La.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.... cons mtg. 6s.	$150,000	†$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	105 1/8	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1943	J. & J.	......	....
New Orleans City RR........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.......Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107 1/2	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105 1/8
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit.........gold 5s.	7,000,000	5,181,000	1945	....	109 1/2	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98 1/4	100 1/2
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	300,000	300,000	1903	J. & J.	101	103
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co.....Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116 1/8	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108 1/8	109
Steinway Ry. (L. I.).........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co...........1st mtg. 5s.	350,000	350,000	1919	....	110 1/8	112 1/8
Third Avenue RR...........1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128 1/4
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	......	....
Twenty-third Street Ry............Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,035,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	300,000	1908	M. & S.	....	....
†Toronto St. Ry............1st mtg. g. 4 1/2s.	4,550,000	2,200,000	1921	M & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	800,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry....................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry..............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1948	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co..................Col. tr. 4s.	29,735,000	29,724,876	1945	A. & O.	....	......
West End Passenger Ry....... 1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg, Pa.

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111 1/2	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	.
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1923	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co......................5s.	2,500,000	2,039,000	1934	J. & D.	......	......
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	W. & S.	......	.....

Providence R. I.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry...................Coupon 5s	50,000	50,000	1910	J. & D.	......	......
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1918	J & J	101 1/4	102 1/4
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,813,000	1,813,000	1912	J & J	101 1/4	102 1/2
Citizens' Railway Co.......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter...1st	1 000 000	500 000	191	J & J	17	

*With interest. *Unlisted.

*With interest

PASSENGER RAILWAY.

St. Louis.

Date of Quotation—Dec 22, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co......................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co..............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co......................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co......................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	131
St. Louis RR. Co......................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	3,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122

†Controlled by St. Louis RR. Co.
‡Controlled by Union Depot RR. Co.
¶Controlled by Lindell RR. Co.
‖$200,000 in escrow to retire 1st & 2d mtg.
§$600,000 in escrow.
††$200,000 in escrow to retire 1st mtg. bds.

San Francisco Cal.

Date of Quotation—Dec 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	3,000,000	3,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co...............1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.................1st mtg. 6s.	250,000	250.000	1914	J. & J.	115	......
†Powell St. Ry........................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co..............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......

†Controlled by Market St. Ry. Co.

Washington D. C.

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Belt Ry. Co.........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry.........................1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home.1st mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......

†$50,000 in escrow to retire 1st mtg. bds.

Miscellaneous.

Date of Quotation— Dec 22, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1923	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,866,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	..
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115⅝
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co.Ry.(N.J.).Cons.mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.)......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.....................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry.........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....

†$1,000,000 in escrow to retire 1st and 2d mtg. bds.
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.
§$760,000 in escrow to retire bonds of C. St. RR. Co.
‖$87,000 in treasury.
¶$980,000 res'ved to redeem prior liens.
††$620,000 in escrow.

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

Boston, Mass.

Date of Quotation—Dec 22 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Delaware Gas Lt. Co.,.........1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	....
General Electric Co..gold coup, deb. 5s..	10,000,000	8,750,000	1922	....	116	......

Pittsburg Pa

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Allegheny County Light Co...............6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co.Scrip 6s.	195,570	......	......	M. & S.	....	......

Miscellaneous.—(Dec 22, 1900.)

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,312,000	4,312,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122¾	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	.....	. ..	......
Kings Co. El. Lt. & Pow. Co.1st mtg. 5s.	2,500,000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co.pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co.1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co(N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

Miscellaneous.

Date of Quotation—Dec 22. 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
					100½	101
American Bell Telephone....................4s.			1908	F. & A.	......	....
NorthwesternTelegraph Co...............7s.	....	......	....	......	....	..
N.Y. & N.J. Telep & Telg Co. gen.mtg.5s	......	......	....	......	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	103	106

ALLIED INDUSTRIES.

Miscellaneous.

Date of Quotation—Dec 22, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
American Electric Heating .... 7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co..............	....	....	......	......	......	25
Barrney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co.........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	......	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The Chicago Union Traction Company has passed the dividend on its preferred stock for the quarter.

The United Telegraph & Telephone Company, Philadelphia, was incorporated at Dover, Del., on December 21 with a capital stock of $2,000,000.

The Boston Electric Light Company has declared a regular quarterly dividend of 2 per cent., payable January 15 to stockholders of record January 1.

It is reported from Chicago that the Union Traction Company of that city is earning at the rate of about 4 per cent. on the first preferred stock.

The Amalgamated Copper Company's dividend is payable January 28 to stockholders of record December 27. Books close December 27 and reopen January 29.

A special meeting of stockholders of the Westinghouse Electric & Manufacturing Company has been called for February 20, to act on a proposition to increase its capital stock.

The directors of the General Electric Company have declared the regular semi-annual preferred stock dividend of $3.50 per share, payable January 31 to stock of record at the close of business January 15.

The American Telephone and Telegraph Company has declared the regular quarterly dividend of 1½ per cent. and an extra dividend of ¾ per cent., payable January 15. Books close December 31 and reopen January 16.

Under the call of the United Electric Securities Company of Boston for proposals to sell a sufficient amount of collateral trust 5s to absorb $39,489 there were received $2,000 of the fifth series, $3,000 of the sixth series, and $2,000 of the ninth series, in all $7,000. The average price paid was 103 and accrued interest.

Advices from Houghton, Mich., state that the Calumet and Hecla mine has made a large reduction in its force during the past 90 days, the cuts affecting mills and sundry surface work as well as the mines. Local estimates of 1,200 to 1,500 men out are probably too high, but it seems likely that the force has been reduced by nearly 1,000 men.

At a meeting of the executive committee of the Erie Telegraph & Telephone Company and the Michigan and Wisconsin Telephone Companies in Boston on December 19 it was voted to recommend to the directors that a regular quarterly dividend of 1¼ per cent. be declared by the Erie and Michigan Companies and a dividend of 1¾ per cent. be declared by the Wisconsin Telephone Company, all payable January 14 to stock of record December 31. Books close December 31 and reopen January 14.

The activity and advance in the Massachusetts Electric Companies' common stock, says the Boston "News Bureau," is the result of the contemplated issue of $2,700,000 4½ per cent. five year notes. The issue of these notes and the sale of the Nashua Company stock places the Massachusetts Electric Companies in a position to pay off its floating debt and brings the common stock within sight of dividends, as this plan obviates the necessity of keeping such a large cash reserve. A dividend on Massachusetts Electric common stock in 1901 is regarded as a certainty.

There is considerable apathy apparent in the copper market, though values undergo little open change. It is a fact, nevertheless, that the inclination to purchase copper has abated to a noticeable degree, and manufacturers are in a fair enough position to pull through the balance of the year on their present engagements. Advices report a slacking off among the valley mills, and full active operations are therefore not expected until after the holidays. Stock-taking will occupy a good share of the manufacturers' attention between now and January. A busy year and a firm copper market are expected in 1901.

The report of the Brooklyn Rapid Transit Company for November shows another decrease in operating expenses. The gross income of this property is a well assured quantity, but the operating ratio must necessarily be reduced in order to show a net income for the stock. Extraordinary expenditures which were made at this time last year have been cut down very largely, this perhaps accounting for the decrease in cost of operation of $15,746. Gross earnings increased $2,141, making an increase in net of $17,887. For the five months ended November 30 the gross earnings increased $213,215, while the net income increased $449,985.

The Metropolitan Street Railway Company of New York offers to existing shareholders the right to subscribe to $7,000,000 par value of unissued authorized capital stock at the price of $160 per share. Stockholders are limited to 7-45 of their present holdings as shown on the records on December 26. The money obtained from this stock issue will be used in paying off the floating debt of the company, which accumulated from the construction expenses of the past year, for the changing of motive power on some of the lines of the company to underground electricity. Subscriptions will have to be accompanied by checks for $60 per share, the remaining $100 to be paid on or before January 30, 1901.

Announcement was made on December 20, of the signing of the recently reputed contract between the Consolidated Railway Electric Lighting and Equipment Company, of New York City, and Vickers' Sons & Maxim, of London, whereby the former company's sytem for car lighting by electricity is to be introduced among the railways of Europe. Isaac L. Rice, president of the Consolidated Company, has been abroad since last July, arranging to dispose of the company's foreign rights. He has now made a contract with Vickers' Sons & Maxim covering a period of twenty-five years, which will give the latter firm a monopoly of the business. The contract, it is said, is most advantageous to the Consolidated Company.

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EDITORIAL NOTES.

The Proposed National Standardizing Bureau.

At the last session of Congress a bill was introduced looking to the establishment of a national standardizing bureau, by means of which accurate scientific methods may be introduced into manufacturing processes and accurate standards and standard measuring apparatus adopted. Such a bureau, as will readily be inferred, would prove invaluable to the electrical industry, which at present has to rely more or less on the apparatus and standards perfected in college laboratories or devised in the experimental rooms of one or two of the large manufacturing companies. Such a method of procedure naturally tends to a wide difference in so-called standard methods and apparatus, resulting in financial loss and frequently in much needless and costly litigation.

Last year the National Electric Light Association adopted a resolution favoring the passage of the bill, but the latter was pigeon-holed for the time being. This important question has again been brought up at the present session of Congress, and only recently the New York Electrical Society passed the following resolutions:

Whereas, It is proposed to establish a national standardizing bureau; and

Whereas, Such a bureau would be of the greatest value and benefit to electrical science and industry in the United States, and assist in the further development of export electrical trade; be it

Resolved, That the New York Electrical Society expresses its approval of the legislation in furtherance of such an object, and

Resolved, That the Society associate itself with kindred bodies to secure the establishment of the bureau.

In view of the interest taken in this measure by the principal electrical organizations in this country, due to the benefits that would accrue to the trade in general and to the export trade in particular, it is to be hoped that the bill will speedily become a law and that the first year of the new century will see this Government equipped with a national standardization bureau equal to that of other countries, for it is a well-known fact that the extensive scientific work carried on in the laboratories of the different departments of the Government requires the use of many standards and instruments of precision which cannot be procured or tested in this country, thus involving a loss of time, inconvenience and lack of uniformity.

* * *

Exports of Electrical Apparatus.

In this the first issue of ELECTRICITY of the new century it might be in place to review in a general way what has been accomplished during 1900—at least so far as the statistics have been compiled—in the way of electrical exports from the United States to other countries. That our electrical export business has grown materially is clearly shown in the fact that the electrical goods shipped from the port of New York alone to Great Britain for the week ending December 19, 1900, amounted to $59,135 as against $9,325 to the same country for the week ending December 23, 1899. Further, the total amount of electrical goods shipped from this port to all parts of the world for the week ending December 19, 1900, amounted in round numbers to $200,000 as compared with $100,000 for the week ending December 23, 1899.

During 1899 there were comparatively few electrical goods shipped from this country to Cuba and the Philippines, whereas during 1900 scarcely a week has passed that several thousand dollars' worth has not gone out to these islands.

In fact such a creditable record has been made in the export business by the electrical industry during the first ten months of 1900—the exports of electrical machinery during that period reaching a total valuation of $4,555,015 as against a value of $2,454,510 for the same period of 1899, while those of instruments and apparatus for scientific puposes, including telegraph, telephone and other electric devices, amounted in value to $5,401,365 during the ten months of 1900, as compared with a value of $4,642,994 for the same period of the preceding year—that no opportunity should be allowed to pass which promises enlargement or widen ing of that business. These figures are interesting and instructive as showing how rapidly our electrical export trade is growing in strength and scope, but even the enormous trade, as shown above, is no fair indication of what is to come. The figures already quoted make it apparent that our electrical manufacturers have taken up the extension of their foreign trade in earnest, and unless all signs fail the result of their efforts will be manifest

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in the creation of a foreign business that will stand out prominently in the record of exports compiled each month by the Treasury Department.

* * *

The Lighting of Railway Trains. At the International Railway Congress at Paris two interesting reports were presented upon the subject of train lighting, covering the methods now and previously in vogue on the Continent of Europe and in Great Britain. The reports, according to the "Railway Age," cover the early methods of lighting by oil, with the statement of its advantages and defects, but the portion of the papers of special interest in the comparison made of the relative merits of gas and electric lighting—including under the former head, gas from petroleum and other mineral oils, pure acetylene, and gas mixed with acetylene, and under the latter head, electric lighting from storage batteries alone, and from storage batteries in connection with dynamos. Among other things, M. Chaperon, of the Paris Lyons & Mediterranean Railway, and M. Herard, of the Orleans Railway, in their report say:

"In gas lighting the cost of installation for the manufacture and supply of the gas is quite considerable. The expense for labor is reduced to the minimum, the services of the staff being limited to wiping the cups and chimneys of the lamps, the examination of the burners and supplying the reserves or tanks of the carriages. The advantages of the system are principally in the quality of the lights, the facility of modifying the intensity as well as the simplicity of the labor in maintenance and cleaning, and in the activity in filling the supply tanks.

"Electric lighting is, without contradiction, that which is presented under the most attractive form. Incandescent electric lamps have, in fact, an incontestable superiority over all the other methods of lighting, as much from the point of view of comfort as that of facility of installation of luminous centers, which may be as intense as desired, and which can be placed at the most convenient points for the passengers. They produce no, or next to no heat, and there is no occasion to provide for the products of combustion being carried outside. The electric lighting of the carriages produced by means of a dynamo driven by the axle during the run of the train realizes, in principle, a complete and rational system of lighting."

The second report, by M. Cajetan Banovits, considers at more length the dangers arising from liability to fire and explosion in the case of gas lighting, which he conceives to be much greater than in the case of oil lighting, and finds in this the excuse for the many Continental railway companies which cling to oil lighting for at least trains of the second order. In his final observations, M. Banovits says:

"In fact, it cannot be concealed that between the methods of lighting by candle and oil on the one side, and electric ligting and mixed gas lighting on the other, the difference is immense. The luminous intensity which has been secured (and which may yet be surpassed by these two last methods of lighting) is such that it unites perfectly all the requirements; and finally electricity presents a complete security against dangers of fire and explosion."

M. Banovits sums up as follows:

"Of all the modes of lighting adopted up to the present time for the lighting of trains, that which seems to us to answer the best to the conditions of a perfect light is electric lighting, for, besides offering the greatest security against the danger of fire, it possesses a proper luminous intensity, assures a light, clean, fixed, exempt from atmospheric influences, and permits a simple and economical dimming for the night. This mode of lighting has, moreover, the advantage of a simple maintenance, and, as soon as its application is made upon a large scale, a service will be assured by proper installations, which will be regular and rapid, even in cases of the densest train movement. Everything in short, invites to the belief that, from the pecuniary point of view, this method of lighting will permit more favorable economical results than have hitherto been attained; and under this head it may pertinently be remarked that the advantages which at the moment other methods of lighting may appear to present over electric lighting are largely offset by the superiority of safety conditions and by the other inherent advantages of the method."

As our contemporary, already referred to ates it is to be regretted that the methods of train lighting in vogue in the United States were not touched upon. The car axle lighting system as made use of on the Santa Fé road, and to a limited extent elsewhere, would seem to be rapidly reaching a state of perfection, both for economy and safety, and it would therefore have been interesting to have heard the French experts' opinion on the system.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

The Frankfurter "Zeitung" says that the Nuremburg Electric Company has started the manufacture of electric typesetters. This is a new departure in Germany.

A patent was issued in this country on December 25 to Anton Pollak of Buda Pesth on a telautograph, for which the inventor makes the following claim: In a fac-simile telegraph, the combination of a vibrating member, a mirror receiving a ray of light from said member, and moving it across a surface, means for moving said mirror at one rate of speed, and means for moving said mirror to a position where it can again move said ray of light across said surface, said last-named means acting to move said mirror at a greater speed than said first-named means.

Mr. Alfred C. Harmsworth, proprietor of the London "Daily Mail," who arrived in this country on December 27, referring to the outlook for American brains and machinery in England, is reported as saying: "You have a big chance now with automobiles. We shall shortly be spending $500,000,000 converting our horse car services to electric; you can get most of that. We must put up two or three times that amount for new suburban surface car systems for our big city. Much of that will go to the immigrant from America."

The lighting of Kimberley, South Africa, by electricity is now a fact. The works have cost $125,000 and comprise among other things two 212 hp. boilers of 110 lbs. steam capacity, supplied by Messrs. Babcock & Wilcox; a 154-tube Green economizer; a Worthington horizontal and a compound vertical feed pump; a 7,000-zinc tube Worthington condenser; a Worthington cooling tower served by a forced draught fan, driven by a 10 hp. motor; two 2,200 hp. engines for driving two direct coupled generators each of 2,500 16 cp. lamp capacity; two 2½ ton overhead tramways for the engine room, and an eight-slab marble switchboard, fitted with 28 instruments. Accumulators are to be provided to afford a night supply of current at an additional outlay of $25,000. The present capacity of the plant is 5,000 16 cp. lamps, but an increase on this it is anticipated will be necessary in the near future.

Nikola Tesla, has been invited by Rear Admiral R. B. Bradford, chief of the Bureau of Equipment, to submit for trial a system of wireless telegraphy which he has developed. Mr. Tesla was in Washington a few days and conferred with Rear Admiral Bradford. He says that he will be able to provide the navy with a system which will be equal, if not superior, to that invented by Signor Marconi. Before finally adopting any special system for the naval service Rear Admiral Bradford proposes to make a thorough investigation of various wireless telegraphy systems in operation.

At a recent meeting of the Liverpool, England, Medical Institution the electromagnet designed by Prof. Haab, of Zürich, Switzerland, for removing small fragments of iron and steel from the eye, was described. Various speakers gave instances of the success of this magnet. It requires about 1¼ kw. to energize it, and is capable of lifting about half a ton.

A representative of the General Electric Company is said to be working on a plan to generate electricity by water power and supply the current to the Union Traction Company and the Philadelphia Electric Company. If the scheme proves to be practical it is said that the United Gas Improvement Company will undertake the enterprise.

A barge canal, costing $62,000,000, following closely the Erie Canal, State Engineer Bond will recommend to the Legislature February 12. Minute details will be given. Electricity may be recommended for motive power. Lieut.-Gov. Wooodruff is positive the recommendations will be agreed to by the Legislature. Then it will go before the people next fall. Mr. Woodruff believes the Legislature should sit until the question is decided.

Consul Roosevelt, in a report to the State Department from Brussels, says that the company which was organized there in 1898 to establish electric traction on navigable ways in Belgium closed its books for the first time on June 30 of last year with a balance of more than $5,074. The company has devoted nearly all its time since its organization to erecting buildings and putting in machinery. Electric traction was first put into operation by the company between Virginal and Ruysbroeck, a distance of 13,669 miles. He says: "Eleven communes have already contracted with the company for public lighting for a period of 30 years, and other communes are negotiating for the same purpose. The company has recently submitted to the Government proposals for

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lighting 11 railway stations between Brussels and Charleroi. The managers believe that before the ending of the third fiscal year their contracts will embrace 10,000 lamps, which, estimated at 15 francs ($2.89) per lamp, will represent an annual revenue of 150,000 francs ($28,-950.) Negotiations are now going on for supplying 240 horse power from 10 to 20 hours per day. From this branch of the enterprise the company calculates upon an annual income of at least 125,000 francs ($24,125). It is equipped to supply electricity for towing by day and night, for small and medium industries, and eventually for vicinal rail and tramway lines and night public lightning.

MODERN electric fire engines are now used in Paris, Tex.

THE Great Dog Falls, over which the drainage of 1,200 square miles of territory passes, are to be developed into electrical power and the power transmitted to Port Arthur, Ont., by wire. The company which will develop the power has been quietly investigating the possibilities of these immense falls. The Ontario Government will be interviewed with the object of securing control of the falls at once. The Great Dog Falls are in an air line about 25 miles from Port Arthur, and according to estimates, are capable of giving 5,000 horse power the year round.

IN the State Archives at Rome it has been found that the X-rays may successfully exhibit the writing on manuscripts concealed in old book covers whenever this writing is done in red lead, ultramarine blue or cinnabar. They are being used also in attempts to detect forgeries of paintings and in efforts to discover signatures of old masters in paintings alleged to have been produced by them.

AN official report shows that the water plant owned and operated by the municipality of Paris netted a profit of 15,000,000 francs ($3,000,-000) during 1900; a small municipal electric light plant, started as an experiment two years ago, cleared 900,000 francs ($180,000).

A SCIENTIST in Vienna, Austria-Hungary claims to have discovered that a very moderate current of electricity will sterilize milk by destroying all the bacteria in it.

THE already practically foreshadowed widening use of aluminum conductors for electric transmission purposes adds interest to Lord Kelvin's recently expressed opinion of them, says "Cassier's Magazine." The weight of aluminum required, he said, is almost exactly one-half of the copper which would produce the same effect. The diameter of cable is 28 per cent. in excess of one made of copper, and the cost of insulation for an underground cable is increased in about the same proportion when we pass from copper to aluminum. Aluminum is not a pleasant metal to deal with, but its high conductivity will make it invaluable for overhead transmission. It is true also that the weight to be supported on posts is half of copper, but the surface exposed to the wind is greater, and its strength is not great. The chief drawback to its use, especially overhead, is its liability to become rotten. This defect does not exist if the metal be pure, and especially if free from sodium. But exposure to the atmosphere, especially near the sea, induces deterioration. The fact that aluminum is easily oxidized ought not to condemn it. The same is true of iron and steel, and yet we do not hesitate to place structures of these metals in exposed positions. Only we paint them; so Lord Kelvin proposes that we paint or varnish aluminum conductors wherever necessary. A few hundred yards of 1¼-inch aluminum wire were put up by Lord Kelvin on a Scotch estate somewhat over a year ago, and on this line he is watching the effects of the weather.

WITH the passing of the solitary Back Bay horse car, but one species of that style of conveyance is left in Massachusetts, and, indeed, in New England. When electricity became a factor in transportation the West End Company of Boston was not slow to recognize its power. In 1888 the overhead system of electric propulsion was inaugurated on the Back Bay cars. From its inception electricity spread over the lines of the West End Company almost too rapidly for people to understand its merit. With the inception of electricity the horse as a motive power was a mark for relegation. So rapid has been the pace of electricity that the little railway at Onset Bay on Cape Cod stands alone as a horse-propelled corporation.

THE Canadian Pacific is contracting for 2,000 horse-power for its road between Rossland and Robson, B.C. It seems that for steep grades and circuitous routes electricity is better than steam. For one thing there is less haulage on account of the source of the power. That is to say, it is not necessary to employ a heavy locomotive, the use of which alone consumes a great deal of energy. If electricity will serve in the mountains it ought to be of even greater economic advantage in a flat country.

LIEUT-COL. CROMPTON, who commanded the Volunteer Electrical Engineer Corps of Royal Engineers during the disturbance in South Africa, has returned to England from Pretoria, and tells some wonderful tales of the manner in which electricity was made use of. The telegraph and telephone wires were constantly in use, and the electric arc lamps threw a bright light on the veldt at points where Boers had wrecked lines or blown up bridges. The khaki cycle was in daily use by the engineers, who plied to and fro repairing wires cut by wily Boers. The traction engines were utilized to work the dynamos which enabled searchlights to sweep the veldt in search of retreating foes, and in this and many other ways electricity was made to play an important part in the war.

THERE has been a tremendous increase in the use of electricity for lighting purposes in New York City during the past year. One of the big electric lighting companies estimates the growth of its own service at from 30 to 50 per cent. or from 1,000,000 or 1,200,000 lamps to 1,400,000 or 1,500,000. A considerable part of this increase is due to the introduction of electricity into new dwellings and apartment houses, but the equipment of the new buildings of several large department stores has also helped to swell it.

A COMBINATION of the Edison and Boston Electric Light Companies of the city of Boston is said to be likely. Circulars calling a meeting of the stockholders of each corporation were recently mailed. The meetings will be held within a fortnight. Each company pays 8 per cent. dividends and earns a great deal more. The new plan is to eliminate competition, and to enable the stockholders to receive large surplus earnings. J. Pierpont Morgan is the largest stockholder in the Edison concern, and it is he who is credited with arranging the details of the proposed consolidation. Very few of the stockholders know anything of the plan. A few, however, have had an inkling of what is coming, and have bought all the stocks of each company that have been offered for several weeks, steadily advancing the quotations. The details of the plan are being kept secret.

IN regard to alterations reported to be contemplated at the Berlin, Conn., electric station of the New York New Haven and Hartford Railroad Company, Superintendent Davidson, of the Hartford division, said a short time ago that, while the third rail system would no doubt be extended, he did not think the changes to be made at Berlin would mean the enlargement of the system at present. Eventually, he said, however, the third rail system would be extended to the line between Berlin and Middletown, Conn.

SOME 900,000 miles of electric wire were in use for telephony in the United States in 1899, with 1,000,000 telephone instruments and 400,000 stations. It is estimated that the capital employed in this industry in the United States approximates $100,000,000. The telephones of the whole world are estimated to number $1,500,-000, with 1,750,000 miles of wire. The telephone service in this country thus approximately equals that of all other countries combined. In 1876 there were 200 instruments working in Europe and 380 in the United States.

HOW wonderfully advanced Japan is in practical applications of electricity may be gathered from a brief survey published in the "Zeitschrift für Elektrotechnik," which reports amongst other information, that the Japanese Government has sanctioned important railway extensions in the island. A number of new full-gauge lines, including a 20 mile stretch between Osaka and Kobe, and two other stretches having lengths of 18 and 13 miles respectively, some of which are already in course of construction, will be equipped for electric traction. An extension of the network of street railways connecting Tokio and the principal factories with the more important seaports is also proposed—this to be likewise equipped for electric traction. It is stated that Japan already possesses upwards of 400 electric generating stations, of which 19 serve solely to supply energy for working street, mine, and factory railways, while the remainder supply energy to towns and villages for lighting purposes, and to factories, etc., for both power and lighting purposes. General supply stations having an individual output of 4,000 hp. and upwards exist in Tokio, Kobe, Nagoya, Yokohama, and elsewhere. The motive power is supplied in each of these cases by steam.

WE are in receipt of a generous sized box of varied colored pencils from the Joseph Dixon Crucible Company of Jersey City, for which we herewith tender our thanks. Pencils are always acceptable to a newspaper office—all the more so in this case owing to the fine quality of the plumbago.

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"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 8.

COILS AND COIL MAKING.

It would be practically impossible to give in one article a full treatise on the subject named, a subject on which volumes have been written, however we will endeavor to give you as clear as possible an explanation of the laws governing the action in different styles of coils, the application of which we will encounter further along in the series.

We might say here that the application of coils is so varied both in purposes and results that it would be out of the question to attempt individual description of the classes, but the laws governing them and their action is what we will try to explain, and it is then left to the electrical student to design the apparatus to suit the conditions or to understand the governing influences of the apparatus in action.

In most coils you will notice that very soft fine iron wire is used for the core. The reason that this is done instead of using a solid piece of iron is as follows:

First—It more readily conforms to the influencing condition.

Second—It is susceptible of a more intense magnetic condition.

Third—To prevent eddy currents. Eddy currents are induced in all closed circuits or masses of metal which are in the influence of a varying magnetic condition. This is productive of heat and causes a loss of power.

It has been proven by experiment that any change in the magnetic field surrounding a wire tends to set up an electric current in the wire, just the same as a change in an electric current which flows in a wire causes a corresponding change in the magnetic condition surrounding it.

A current of electricity flowing in a circuit will induce a current in a parallel circuit as long as the magnetic condition surrounding the first, or inducing conductor, is kept in motion.

Lines of force, whether radiating from a conductor over which a current is flowing or from a magnet, will induce electrical action in a conductor, within its influence, as long as the magnetic condition is kept in motion. Also if the conductor be put in motion and the magnetic condition remain stationary, the same results will follow. A result will be accomplished so long as either one or both be in motion.

When a current is made (started) in a circuit its magnetic lines commencing at zero circle outward and will induce electrical action in a parallel conductor in just the opposite direction to the flow in the primary or inducing circuit.

When a current is broken (stopped) in a circuit the magnetic lines will decrease in strength, circling inward toward zero point and induce electrical action in a parallel conductor in the same direction as the flow in the primary or inducing circuit.

The induced electrical action only exists while the magnetic lines are in motion, which occurs only when the primary current is disturbed.

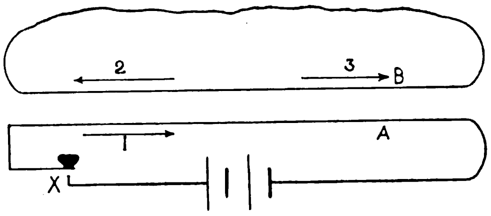

FIG. 1.

In Fig. 1 if a current be started in the circuit A by closing the key X then the magnetic lines will circle outward cutting the parallel conductor B and inducing in it a current in the opposite direction to that flowing in A or as indicated by the arrows 1 and 2.

If the key X be opened, breaking the circuit, then the lines of force will circle toward their center or vanishing point, and in doing so will cut the parallel conductor B in just the opposite direction that they did before and induce in it a current in just the opposite direction to that first induced, which will be in the same direction as the inducing current, indicated by arrow 3.

If the primary circuit be wound as a coil on an iron core, the lines of force will be collected and the acting magnetic condition thereby intensified, producing greater results in a parallel winding which is wound over the primary circuit.

The coil which contains no other source of electrical action than that received by induction is called the secondary. The coil in which the original or inducing current flows is called the primary.

The magnetic condition produced by a primary coil besides acting on a secondary or separate coil will also act upon itself, and why not? The law of induction says that current flowing will induce action in a parallel conductor, and is not every turn and layer in a coil parallel with itself? Then action will be set up within itself by its own influence just the same as in the secondary, and this condition is called the law of self-induction. When a current is started in a coil and the lines of force cut the turns of the coil in their outward path, it induces in them an electric pressure which opposes the growth of the current. On opening the original current the magnetic field quickly dies away and the lines of force again cut the turns of the coil, but this time in such a direction that the self-induced pressure upholds the original current.

This effect of self-induction is made use of in a number of ways, one of which is the ordinary gas lighting coil, which is simply a coil containing many turns of insulated wire wound on a core of iron wire. Let us follow out the law in this coil as an example.

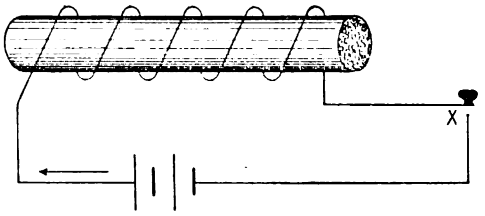

FIG. 2.

In Fig. 2 when a current is passed through the coil by closing the key X the core becomes magnetized and the lines of force radiating from its poles cut the turns of wire in the coil as it increases, which tends to set up a flow in the coil in the opposite direction to the original current. When the magnetism has reached its full value and remains so the induced action stops.

Now break the circuit at the key X and you will discover that quite an intense spark will be given out across the contacts during the break. This is caused by the lines of force decreasing in strength and cutting the turns of wire on their inward path, causing an induced action in just the same direction as the original flow, or in other words, helping it so that the original current plus the induced action causes the intense spark which is the result secured by the gas-lighting coil.

In summing up the conditions encountered in coils we find the following laws governing their action, which must be taken into consideration in their construction and in the object to be attained by their application.

When a circuit is made or a flow of current increased the induced action is always in the opposite direction.

When a circuit is broken or the flow of current decreased the induced action is always in the same direction.

No induced effect will be attained unless the primary or inducing current is being made and broken or else when the rate of flow is being varied.

The induced action in a secondary coil causes a magnetic field which opposes the growth of the primary magnetic field when the circuit is made and opposes the decay of it when the circuit is broken.

When electric currents are induced by a changing magnetic field, the magnetic field belonging to the induced current tends to stop the change in the original field.

The varying of the magnetic field of a coil will act upon its own windings, tending to retard both the increase and decrease of the flow, which is called the law of self induction.

A flow of current does not necessarily have to be made and broken to cause induced action; varying the rate of flow in any degree will produce an effect.

These laws, as given above, are the governing influences which determine and control the action of all such coils as electro-magnets, induction coils, spark coils, retardation coils, impedance coils, transformers, solenoid coils, repeating coils, etc.

Of course these coils will all come up for explanation later on in the series when we come to their application, but we would respectfully ask the student to thoroughly digest this article, for on these laws depend nine-tenths of the electrical phenomena of to-day, and as we come to the application the action and part performed by these coils will be readily seen and clearly understood.

Article No. 9 will be entitled "The Principle of the Dynamo."

Will Use American Machinery.

Electricity is conquering the world with greater rapidity than did its mighty predecessor in mechanical achievement, steam. The gradual opening of the trans-Siberian Railroad has led to the introduction of electric light and electric machinery into the towns of Siberia. Recently the municipality of Vladivostok resolved to build at once about 20 miles of electric tramways, and to light the town with electricity. Most of the machinery will be of American manufacture.

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LIQUID FUEL.*

BY E. L. ORDE.

The early history of liquid fuel has been so ably put before this Institution by the late Mr. B. G. Nichol and later in the admirable paper of Mr. Wallis, that there is no need today to recapitulate what has been done up to the present time with this form of combustible. The writer, however, ventures to think that the practical results of some experiments with which he was entrusted, and the conclusions to which they have led, may be not without interest to the members of this Institution, and may at all events, form the basis of a profitable and interesting discussion. It is only within the last few years that liquid fuel has come within the province of engineers in this country, owing to the fact that hitherto it has only been practically obtainable in the vicinity of the Caspian Sea at such a price as renders it commercially possible. Within the last few years, however, a considerable change has taken place. New oil fields have been discovered, and the number of places along the eastern route at which liquid fuel can be obtained has increased so enormously that it becomes a serious question for shipowners to consider whether it is not an absolute economy to use it in preference to coal on vessels trading to the eastward. The solution of this question lies first in the cost of the fuel and its practical calorific value as compared with coal. Secondly, in its effect on the life of the boiler furnaces in which it is burnt, and thirdly, perhaps the most important of all, its immunity from danger. The first point is, of course, constantly varying, and is one which the writer is not in a position to pursue. The two latter practically resolve themselves into one—the efficient combustion of the fuel. The existing appliances designed for the purpose may be broadly divided into three.

1st. Those in which the liquid fuel is injected into the furnace in the form of a spray by purely mechanical means.

2d. Those in which the spray is produced by the introduction of a gaseous medium, and

3d. Where the liquid fuel is introduced into the furnace in the form of vapor.

Before considering the respective merits of these three classes of apparatus it will be advantageous to realize the actual possibilities of the fuel. The experiments which the writer carried out were made with crude Borneo oil, which is in all respects an excellent fuel oil, and is to be obtained in large quantities. Its composition is:

Carbon........................	87.09 per cent.
Hydrogen.....................	10.78 "
Oxygen........................	1.24 "

The flash point is 211° F.; the boiling point is 395° F. The calorific value determined by the bomb calorimeter is 18,831 B.T.U. It is an exceptionally clean and mobile fuel oil, and with its high-flash point the risk of adventitious explosion is reduced to a minimum. All fuel oils are exceedingly complex, inasmuch as they are made up of a number of combinations of carbon and hydrogen which only a chemist, who has devoted himself to investigating hydrocarbons, can appreciate at their true significance. The importance of this point for the practical purposes of the engineer lies in the fact that the various constituents of the fuel give off vapor at temperatures varying from about 100° F., up to the boiling point of the oil, and when the boiling point is approached —unless special precautions are taken—a residue of solid carbon is formed which will soon choke any pipes or narrow passages through which the fuel may have to pass. Having thus considered the characteristics of a typical fuel oil, we may now return to the consideration of the apparatus for burning it.

In the first type—the purely mechanical spray —the oil is discharged under pressure into what is commonly called a burner, which is made of such a form that the effluent jet is broken up into particles sufficiently small to burn readily at the firing point of the fuel. The full efficiency of the system can only be obtained by lining the furnace with firebricks, or other non-conducting material, so as to raise the furnace temperature (by preventing the absorption of the heat into the boiler) until it is sufficiently high to vaporize the greater portion of the oil before it is burned. The quantity of air required to complete combustion is very largely in excess of what is chemically necessary, and the furnace space required for oxidation is large. The advantages of the system are: First, its simplicity; and secondly, its noiselessness. As regards efficiency, the best results that the writer has been able to find recorded show an evaporative efficiency of about 12.5 lbs. of water from and at 212° per pound of oil. With Borneo oil this gives a fuel efficiency of 64.6 per cent. In the second class the oil is introduced into the furnace in the form of a spray in the presence of a gaseous medium—be it steam or air. In most of these appliances a partial lining of firebrick is fitted in the furnace, and a brick bridge or baffles of various forms are built with a view of obtaining complete oxidation of the fuel. The earliest form of this apparatus consisted simply of two pipes, lying one above the other, and having their ends flattened so as to spread the streams of oil and steam. Oil is admitted to the upper pipe, and is allowed to drop from the orifice into the jet of steam which passes through the lower pipe and meeting the oil breaks it up into particles sufficiently small to ignite as soon as the firing point is reached. This simple device has been improved upon by numbers of engineers, and most of the improved burners of this type take the form of concentric tubes, through which the oil and steam are passed. Adjusting arrangements are always provided, so that the supply of the two elements can be regulated at will. This type is better known than any other, and has, so far, given the best results. The evaporative efficiency of the best burners of this type seems to be about 13-14 lbs. from and at 212°, but the supply of air required for oxidation though smaller than that demanded by the first-class burner is much above what is chemically necessary. The difference between steam and air as spraying media will be touched upon hereafter. The third class of apparatus, that is, in which the fuel oil is wholly or partially vaporized, promises to give the best results.

Attempts have been made so long ago as 1867 to produce an apparatus on the system, and Colonel Foote claimed remarkable results for his method of solving the problem; these results, however, seem not to be well authenticated. Later, Messrs. Dorsett and Blyth attempted to boil the fuel in one boiler and burn the resultant vapor in the furnace of another. This, however, does not seem to have been very successful. Mr. Thwaite has since then made an apparatus consisting of a retort which is maintained at a red-heat, and into the retort a spray of steam and oil is blown; the oil is immediately volatilized and passes through holes in the retort into the furnace, where it is met by a stream of air in which the vapor burns with a clear blue flame. The results are said to be satisfactory, but it is difficult to see how such a process can be carried out with ordinary fuel oils without producing a large deposit of carbon in some form in the retort. An experiment tried by the writer with an apparatus on this principle showed that it was possible to produce a high-furnace temperature and a smokeless fire, but the retort was soon completely choked with solid carbon, or, if the temperature was allowed to fall, with a pitch-like substance. This deposit presents the greatest difficulty in the way of vaporizing so complex a body as the ordinary fuel oil. As has been pointed out before, the oil consists of a number of hydrocarbon combinations, each of which has a different boiling point.

Another important characteristic of these hydrocarbon compounds is that in the presence of superheated steam they can be completely distilled without cracking, and the explanation of this fact (on which depends the Ragosine process for refining petroleum) has been stated to be that in the presence of superheated steam the boiling point, or, more correctly, the mean boiling point, of the oil is lowered. This distillation, however, does not apparently take place with any other medium but steam. To insure distillation it is necessary that the temperature of the oil should be raised to as near the boiling point as possible before it is admitted into the presence of the steam, and it is in this part of the process that the danger of cracking appears. In the apparatus fitted by the firm with which the writer is connected the difficulty has been overcome, and so far as it has been possible to ascertain, by ordinary means, complete vaporization has been secured.

The vapor thus produced can be completely oxidized by the amount of air chemically necessary, and a larger quantity of oil can therefore be treated in the same furnace space than by either of the two other systems, while the combustion as shown by the analysis of the waste gases is complete. Two typical analyses are given below:—

Analysis of waste gases.		Per cent.	Analysis of waste gases.		Per cent.
Carbon dioxide	equals	13.2	Carbon dioxide	equals	12.6
Oxygen	"	3.6	Oxygen	"	4.0
Carbon monoxide	"	0.0	Carbon monoxide	"	0.0
Hydrocarbon gases	"	0.0	Olefines, etc.,	"	0.0
Hydrogen	"	0.0	Hydrogen	"	0.0
Nitrogen	"	83.2	Nitrogen	"	83.4
		100.0			100.0

The only feature calling for remark is the somewhat large percentage of uncombined oxygen, which is no doubt due to leakage around the smokebox. As regards efficiency an evaporation of from 15-16 lbs. from and at 212° should always be obtained with dry Borneo oil.

The hydrocarbon vapor is exceedingly unstable and appears to depend for its existence entirely on temperature. Efforts have been made to collect samples for analysis, but without success. In appearance it is of almost milky whiteness, closely resembling the vapor given off from the retort used in the Pintsch gas system. The smell is pungent, and severe irritation is set up in the membranes of the mouth and throat if the vapor is inhaled. At the temperature of the external air (60°) it was found almost impossible to ignite it, and the outer surface of the jet was at once condensed and formed an oil deposit of a very much lighter

* Paper read before the North East (England) Institution of Engineers and Shipbuilders, Nov. 16, 1900.

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color than the fuel oil itself. The flame when the vapor is burned in a boiler furnace over a layer of broken firebrick is of dazzling whiteness and becomes almost transparent as it approaches the bridge. The exact form in which the combustion of these hydrocarbon vapors takes place does not seem to be clearly understood. The appearance of the flame at a distance of a few inches from the nozzle of the burner suggests that at that point the hydrocarbons are burning in the form of acetylene. All gaseous hydrocarbons when exposed to a temperature of 1,000° F. become acetylene, and it seems fair to assume that the vapor will do the same. As the flame proceeds further into the furnace, however, and the temperature becomes higher, the hydrocarbon combination must break up and the rest of the vapor is probably burned as carbon monoxide and hydrogen. This theory is put forward with diffidence in the hope that the reaction which takes place may be more worthily dealt with in discussion. There seems to be no doubt that the efficiency of liquid fuel lies in the fact that it is capable of being turned into vapors of high calorific power, and that the vaporizing process does not demand a large heat expenditure.

The two classes of apparatus first described do not vaporize the fuel before combustion begins, which means that of the heat generated in the furnace some considerable part is absorbed for this purpose, and is therefore not available for evaporating water. To attain to the temperatures required for complete vaporization, part, at all events, of the constituents must be exposed to the heat of the furnace, but with careful design the quantity of heat thus abstracted can be reduced considerably below that which is necessary to carry out the process when the fuel is simply injected into the furnace as spray. The fact that superheated steam lowers the boiling point of hydrocarbon oils, and therefore prevents cracking, renders its employment essential if it is desired to burn the fuel as vapor. The objection to using it on board ship is, of course, the loss of fresh water and the amount of heat lost in making this loss good by distilling sea-water; this loss, however, is—the writer ventures to think—more than compensated by the gain in efficiency due to using steam as a distilling agent. Mr. Morison has published some calculations of the quantity of fuel required for distilling purposes and applying these calculations to a steamer with engines indicating 2,000 hp. at sea, the quantity of oil fuel required to make up in the evaporator the water lost in the burners only amounts to one quarter of a ton per day of 24 hours. In this calculation, Mr. Morison's calculated result has been multiplied by four to allow for deposit on the surface of the evaporating coils. With air as a spraying agent, there is, of course, no loss of fresh water, but it is questionable whether the quantity of steam used in the air compressors is not greater than that required in the burners and evaporators together. The complete combustion of petroleum spray depends, firstly, on the correct relation between the volumes of the oil and the spraying agent, and secondly, on the velocity of the spraying agent, both of which requirements place air at a considerable disadvantage as compared with the steam. The general conclusions produced from the investigations the writer has made are as follows:

1. Liquid fuel of good quality, such, for instance, as Borneo oil, used in boiler furnaces, if efficiently treated, should show a reduction in consumption of about 40 per cent. as compared with coal.

2. A reduction in bunker space of about 15 per cent. for the same weight of fuel; a reduction of about 50 per cent. for the same radius of action.

3. A reduction in the stokehold staff of at least 50 per cent.

The advantages of the liquid fuel as regards ease of manipulation, cleanliness, absence of smoke, reduced temperature of stokehold as compared with coal, increased life of boilers owing to constant temperature, improved performance of engines owing to constant steam pressure, need not be enlarged upon to the members of this Institution, but the question of immunity from danger requires some consideration. With a fuel oil of which the flash point is 200°F. or over there should be no risk of explosion whatever, and unless there is want of ordinary care in the management of the burning apparatus and the fuel supply the danger of fire ought not to exist. Still, fires have occurred, and it may be well to consider the causes from which they have originated. The most fruitful cause appears to be intermittent action of the burning apparatus. This may arise from dirt in the oil or from the presence of water. To get rid of the dirt it is only necessary to provide an efficient filtering apparatus and this should form a part of all liquid fuel installations. The second cause, the presence of water, presents a more difficult problem. All crude oils have a certain proportion of water intimately mixed with them, and as the specific gravity of most fuel oils is from 0.9 to 0.98, and in the case of some shale oils even higher, it is obviously exceedingly difficult to eliminate this water by gravitation unless the temperature of the mixture is comparatively high. The expansion of oil under increase of temperature is considerably greater than that of water, and some arrangement whereby heat can be applied to the contents of the bunker seems to be necessary where crude oil is used. In furnaces where the oil fuel is burned in the form of vapor the danger of extinction from the fact that water is present is of course considerably reduced, for any temperature that is sufficiently high to vaporize a fuel is more than sufficiently high to evaporate water, so that when water passes into the apparatus with the oil it flashes into steam, and though it breaks up the stream of hydrocarbon vapor does not prevent each fraction from burning unless the amount of water is abnormally large. An experiment made by the writer showed that the fire was not extinguished when water was present in the proportion of five parts of water to three of oil. The water in this case was added gradually, and the contents of the bunker were constantly stirred so as to secure as complete an admixture of the oil and water as possible. With a burning apparatus of the second type, where the oil fuel is introduced in the form of spray, the danger of extinguishing the fire when water is present is of course much greater, but with a well designed installation and proper care on the part of the attendants such accidents as fires should be impossible.

II.—HIGH TENSION POWER TRANSMISSION PLANTS IN FRANCE.

BY FRANK C. PERKINS.

Monophase and Triphase Plant at Chapareillan-Chambery

The alternating current power transmisson plants as installed by the Société L'Eclairage Electrique of Paris are all equipped with apparatus designed by M. Labour. In each succeeding plant which was built in France by this firm, improvements were made and the power transmission system by alternating currents was in each case proven to be the best means for flexibility, cheapness, economy and satisfactory operation.

FIG. 4—POWER HOUSE AT CHAPAREILLAN, FRANCE.

Gradually the potentials used were increased and success followed each new project. At the Chapareillan-Chambery alternating transmission plant the pressure was first placed at 5,000 volts, but later other machines were installed and the voltage increased to 15,000 volts.

The power house (Fig. 4) of this plant is located in the valley and is situated at a distance of 10 to 12 kilometers from Chambery, where the current is used for lighting and power purposes. The power station is located at the

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Chapareillan end of the line, is substantially built of stone, and is divided into two parts for turbine room and generator room. In the generator room (Fig. 5) there are two direct connected units, each group having a capacity of 200 hp. The alternators are of the monophase type as first introduced, and later were supplemented by triphase generators. The voltage of the monophase alternators as delivered by the machines is only 110 volts, and is conducted through the switchboards to the transformers. Each alternator is supplied with its own switchboard, furnished with main switches, ammeters, voltmeters, and other measuring instruments for both alternating and direct current for excitation. Step-up static transformers raise the potential to 5,000 volts, which was the potential first used on the line. The three-phase machines supply a polyphase current which is raised in voltage to 15,000 volts.

The latest machines produced by the Société L'Eclairage Electrique generate a current of 30,000 volts direct for the transmission lines. The machines were exhibited by this firm at the World's Exposition just closed at Paris. They created great interest from the fact that by the use of such machines as these it is possible to do away entirely with the step-up static transformers, and the only conversion necessary is by the use of step-down transformers to reduce the high tension line current to a moderate pressure for local distribution. This high-tension alternator has a fixed armature and a revolving field. The insulation of the armature is thus more easily accomplished and practically as high potentials can be generated direct by the alternators as can be produced by means of static transformation.

The speed of the high potential machine shown in Paris was 420 revolutions per minute. The frequency of this machine was 50 periods per second, which is fast becoming a standard frequency for all polyphase machinery at present being built abroad. Much of the American apparatus is still constructed with 60 cycles and 133 cycles, but the tendency is toward a lowering of the number of alternations. While 60 cycles is extensively used in American plants for lighting systems, a frequency as low as 25 cycles is rapidly coming into use for power installations. The use of incandescent lamps on circuits with frequencies as low as 25 cycles has never been considered practicable, but more than 200,000 lamps will be operated by Niagara power at this frequency at the Pan-American Exposition, and this test will give a good opportunity to judge of its adaptability.

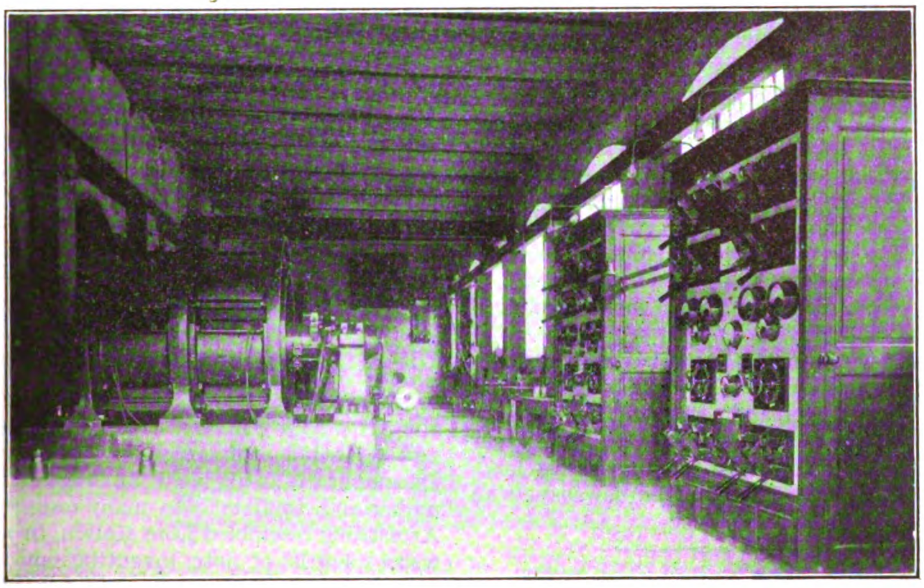
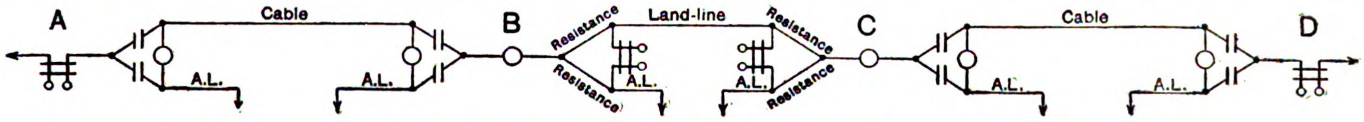


FIG. 5.—GENERATOR ROOM AT CHAPAREILLAN, FRANCE.

RECORDER WORKING ON COMPOSITE LANDLINE AND CABLE CIRCUITS.*

BY A. DAVIDSON.

The application of Harwood's duplex arrangement to circuits composed of cables and landline, as shown in the accompanying diagram, is, so far as I am aware, novel; and, in view of the extending use of the siphon recorder for landline work, cases may happen where it would be useful. The diagram is almost self-explanatory, and I will only offer a few remarks on the working of the system in practice. B and C are the terminal stations of the landline. The signals from station D, received at C in the usual way, are transmitted direct to station A. Signals from A are similarly transmitted by B to station D. The landline recorders at B and C are permanently in circuit in order to give a record of what is passing through and also to show the state of the balance. If B's recorder is practically unaffected when B is sending to D, while the signals from C to A are of legible size, the same state of things will obtain at A's recorder and duplex working will be possible. The arrangement can be divided up for sectional working by introducing earths at B and C on the apex to apex lead. The principal source of disturbance is, of course, the variation of the insulation of the landline, but the recorders at A and D are so far away electrically that the landline balance must be out very considerably before the incoming signals are affected. I think it will be found, in all cases, that the effect of the cable capacity on the landline balance can be sufficiently compensated by tapping on a large capacity near the end of the landline artificial lines. In many cases this will be unnecessary, and a balance, so far as the distant recorders are concerned, will be obtained by means of a simple resistance. I should point out that the lower the resistance of the landline the better the balance will be. Well-insulated signaling batteries and cable transmitters at B and C are essential. There is no great practical difficulty in maintaining this condition as most stations are (or should be) provided with a direct-reading voltmeter and milliammeter, with which rapid daily tests of the general condition of the batteries can be taken. On a duplex human relay system the arrangement practically amounts to the elimination of one station without introducing any extra contacts or moving parts. I may add that the system has been worked successfully over a tropical landline subject to heavy varying leakage.



*From the "Electrician," London.

Care of Boilers.

Whatever plan is adopted for securing water to feed the boilers should not interfere with the general plan of feeding at the same rate that the steam is used, so that the water line will remain nearly in the same place at all times.

In every plant where there are two or more boilers, it is sometimes necessary to lay off one of them for cleaning or repairs. In fact, every plant should have an extra boiler to use in case of necessity, and this means whenever it is advisable to clean one of them, as the practice of running boilers almost continuously should be discountenanced on all convenient occasions.

The plan of leaving boilers empty is a good one, provided steam and water are excluded from them. This opinion is based on experience in starting up a boiler that had not been used for fourteen years, for no internal corrosion was found in it, while the external parts were but slightly affected by its long rest. It was set in brick according to common practice, two walls of the building serving as a part of the setting. After it had been thoroughly inspected it was run for several years under as much pressure as a new boiler of equal diameter is usually allowed in this vicinity without calling for repairs except tightening two braces, and probably this was needed before it was laid off.

When boilers are to be left idle for a long time they should be thoroughly cleaned as soot collects and holds moisture, so that corrosion goes on underneath the apparently harmless covering until the plates are ruined. A coat of good paint suitable for iron-work will assist greatly in preserving boilers out of use, and as the expense of it is small, it does not pay to neglect it, for good second-hand boilers are frequently wanted by parties who do not care to invest in new ones for reasons of their own; but when corrosion is allowed to eat into the tubes and plates they will soon be fit for the scrap heap only, and are not especially valuable even there.

One advantage of a power pump and a driven well in connection with a good heater is that all of the pumping must be done before the engine is shut down, which means that exhaust

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steam is passing through the heater, and no cold water can reach the boiler. An injector, says the "Boilermaker," London, is very convenient in such a plant, because it may be run to fill up the boiler after the engine is shut down.

INVENTIONS OF THE CENTURY.

623,535 Patents Granted in the United States in Sixty-two Years.

(From the "New York Sun.")

This has been a century of mechanism. A hundred years ago people were content to live by hand, as it were; now people live chiefly by complicated machinery. Civilized man's mode of existence has been totally altered by his inventions.

The world has gone patent mad. In the United States alone there were 623,535 patents granted in the sixty-two years from 1837 to 1899. During its existence the Patent Office has received more than $40,000,000 in fees. On carriages and wagons more than 20,000 patents have been granted; on stoves and furnaces, 18,000; on lamps, gas fittings, harvesters, boots and shoes and receptacles for storing, 10,000 each. The total of patents for the civilized world is easily twice that of the United States.

With the invention of the steam engine the world shrunk at a bound to a twentieth of its former size. Where the lumbering stagecoach or the plodding caravan took weeks the flying express covers the distance in a few hours. The trip across the Continent used to be a matter of life and death. Now it is a matter of $100 and take your ease as you go. In 1825, the first steam road was opened between Stockton and Darlington, England. A year later a similar experiment was made at Quincy, Mass., where the engine hauled stone for a distance of four miles. The first passenger road in this country was the Baltimore & Ohio, opened in 1830, with a mileage of fourteen miles. To-day, there are 210,906 miles of railroad in this country, 163,216 in Europe, 26,834 in South America, 31,102 in Asia, 9,978 in Africa, and 14,384 in Australasia.

Early in the history of railroading twelve miles an hour was considered recklessly fast. In January, 1899, a train on the Burlington route, in a run from Siding to Arion, 2.4 miles, did the distance in 1 minute and 20 seconds, or at the rate of 108 miles an hour.

Mail communication was as expensive as it was slow in the old days. It cost a shilling to get a letter anywhere, when the century began, and a shilling in those days represented far more than it now does. Now two cents will carry a letter to the Philippines or around the corner. Then the mail matter handled was too insignificant for statistics; now there are 75,000 post offices in this country, handling postal matter of all kinds to a total of 6,576,310,000 pieces.

The first telegraph line in this country was opened in 1844. In 1899 there were 904,633 miles of wire in use in this country; 71,393,150 messages were sent that year.

The year 1800 knew no telephones. A hundred years later sees 772,989 miles of telephone wire in use, connected with 465,180 stations, and answering 1,231,000,000 calls a year. When the century was new it took six weeks to get news from Europe. To-day it takes six seconds. To-day there are 170,950 miles of submarine cable, all laid since the first cable, Field's great achievement, was laid in 1857.

Electricity has come to the aid of steam in traffic. There are more than 1,000 electric street car lines in operation in the United States, with a capitalization of $1,700,000,000. The same electric power, only dimly known before the wonderful century, now lights our cities. In the United States there are half a million arc lights and about twenty million incandescent lights, the latter being equivalent in light-giving capacity of 320,000,000 candle tips such as they used in 1800.

While the railroads have served to diffuse the population from one end of the land to the other, another invention has served to centralize it—the elevator.

In other times they built houses of wood and brick. Now they construct them of steel and iron. And so carefully are the plans developed that the architect can say how many bolts will be required in the construction of a skyscraper, how much each beam can support, where each piece of iron belongs. Wooden bridges have been supplanted by huge steel structures. Even stone towers are being abandoned for the lighter steel. The age of steel is here.

Our vast factory systems employing thousands of workers and furnishing necessaries and luxuries alike at prices that would have amazed the citizen of 1800, have grown out of the substitution of machinery for the hand; the sewing machine, the steam loom, the ring frame, and hundreds of other inventions.

Photography is a product of the last hundred years.

In 1800 the principal daily papers were published in Boston and New York City. The type was hand made and hand set. Nowadays new type is cast while being set; paper comes in rolls from two to four miles long; presses run off 80,000 complete newspapers an hour.

LONDON NOTES.

(From our London Correspondent.)

The Direct Current Arc.

Few papers which have recently been read before the Institution of Electrical Engineers have excited more genuine scientific interest than that read by Mr. W. Duddell on "Rapid Variations in the Current through the Direct Current Arc." Mr. Duddell's previous work and inventions, which were not long ago demonstrated before a similar audience, secured for him an enthusiastic reception. The paper read by him on December 13 on the subject mentioned was illustrated by a most interesting series of experiments, including the use of the arc as a telephonic receiver and transmitter, but his musical arc effects were even more attractive.

Electric Traction vs. Magnetic Observatories.

There are serious indications that electric tramway enterprise in this country is to be hindered so that the magnetic observatories may be spared. For some time a committee has been conferring in London upon the whole subject. The professional element stands up for the observatories, and advocates the continuation of their records uninterrupted by electric tramways or any such thing. The Board of Trade appears to have leanings in the same direction, but the electric traction representatives on this committee strenuously oppose. A most important case has arisen in West London, where the London United Tramways Company's system is ready for running if only the Board of Trade will pass it. But the Board will not do so, and is pressing for insulated return. This, it is represented, would cost the Tramways Company somewhere between $250,000 and $500,000, whereas to remove the Kew Observatory—the cause of the trouble—would perhaps cost $10,000 to $15,000. It was originally intended to have the line worked by double trolley method so as to avoid any trouble, but this provision seems to have been repealed, and the plans, specifications, drawings and so on, all altered, so that after all only a first-class trolley wire system has been laid down. As matters now stand there appears to be a deadlock. If the London United has to give in, the outlook is not promising for other undertakings of a like character.

OBITUARY.

W. H. Moore.

Mr. W. H. Moore died at his home, on West 6th street, Plainfield, N. J., Wednesday, December 26, after an illness of six weeks with typhoid fever. He was 46 years old, and was born in Rahway. He was associated intimately with Mr. Edison, and was largely instrumental in perfecting the incandescent light. He leaves a wife.

Sir William Armstrong.

Lord William George Armstrong, inventor of the Armstrong gun, and writer upon electrical and scientific topics, died on the morning of December 27, at his home at Cragside, Northumberland, England. In many respects Lord Armstrong resembled Lord Kelvin, in that he was a scientist of note, inventing not only the gun which bears his name, but the hydraulic crane and other important devices. Lord Armstrong founded the Elswick Engineering Works in 1847, from which yards many fine ships of war have been turned out. Sir William Armstrong was raised to the peerage in 1887, on the occasion of Queen Victoria's jubilee.

Papers to be Read at the Northwestern Electrical Association Convention

Some of the papers which will be presented at the meeting in Milwaukee on January 16, 17 and 18 of the Northwestern Electrical Association are as follows:

"The Rate Question," by Henry L. Doherty, New York; "Synchronous Converters," by Prof. W. I. Goldsborough, Purdue University; "The Series Incandescent Lighting System of the Future," by P. D. Waggoner, Schenectady, N. Y.; "Practical Line Construction," by Loren W. Burch, Madison, Wis.; "Education of Central Station Employes," by Prof. D. C. Jackson, Wisconsin University.

IT is said that a member of the Automobile Club of America, is writing a playette in which the "auto" will take a prominent part. The time of the play will be A.D 2000 and one of the incidents will be the fright and demoralization of the motor vehicles and chauffeurs by a prehistoric beast called a horse.

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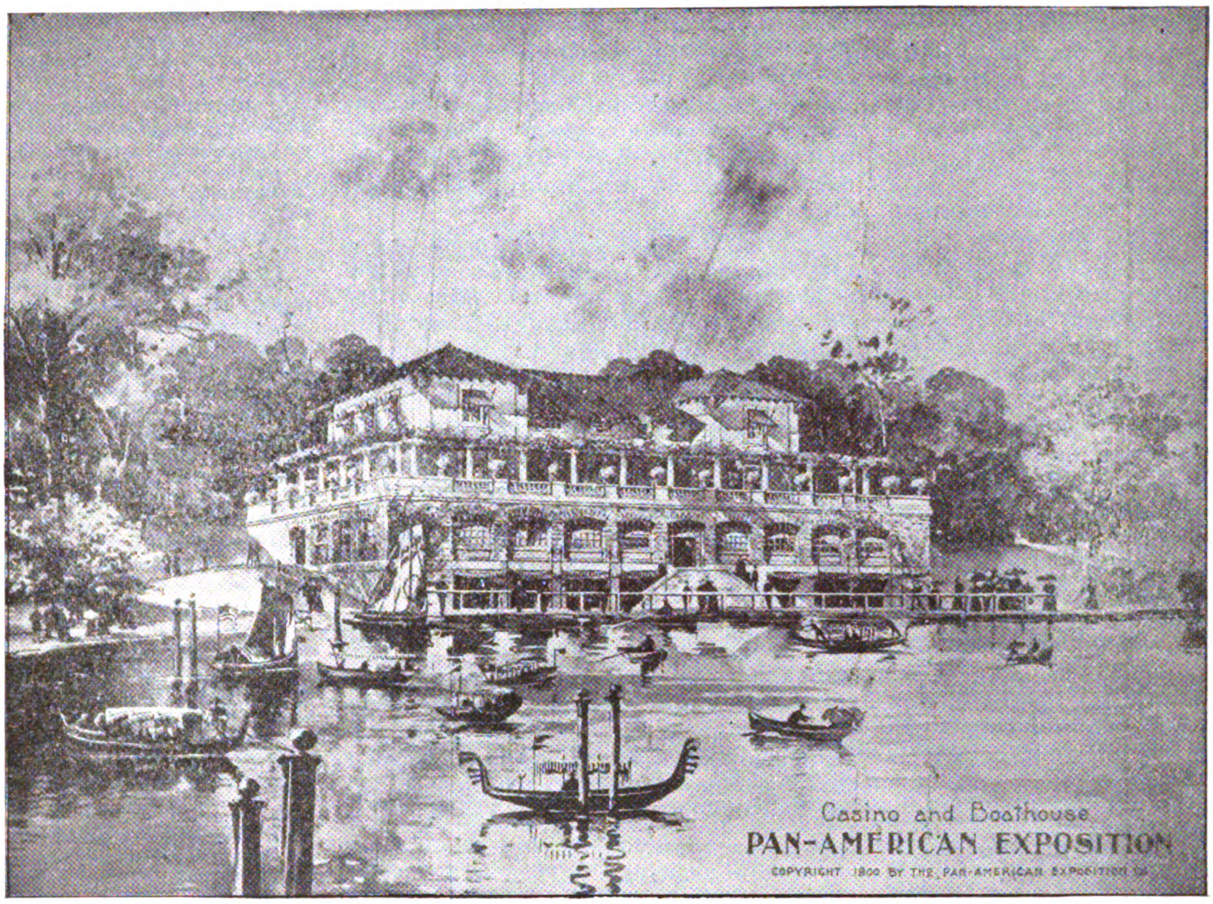
PROMINENT FEATURES OF THE PAN-AMERICAN EXPOSITION.

The Pan-American Exposition at Buffalo may appropriately be termed the "City of Light," as electrical power sufficient to run all the machinery of a large city will be required to illuminate it.

The new Casino and Boat House on the south bank of the Delaware Park Lake, a little to the east of the bridge of the Three Americas, is in a sense a tribute paid to the Pan-American Exposition by the city of Buffalo, though it will be of service for many years after the Exposition has become history. It is a very attractive building, with many conveniences which will be greatly appreciated by visitors.



The first or basement story is built with Buffalo Plains limestone, very rustic in character and decidedly picturesque. In this story will be a restaurant and lounging room. A corridor extends through the entire length of this story of the building, affording ample room for the storage of bicycles and other uses. The basement story will be surmounted by a balustrade of Indiana limestone with turned balusters. Over a large portion of this story will be an open terrace covered by a pergoda. Perhaps the term peristyle would best describe this part of the structure. The columns introduced here are free Doric. The terrace will be of concrete construction with granolithic floors. The building material above the basement story and aside from the terrace will be white bricks, with a roof of rich red Spanish tiles. The second story will be devoted to amusements, and the third story will be occupied as living rooms by the lessee of the building.

Underneath the basement story is the place of storage for boats during the winter, and extending out over the water is a boat platform, 128 feet long and 22 feet wide.

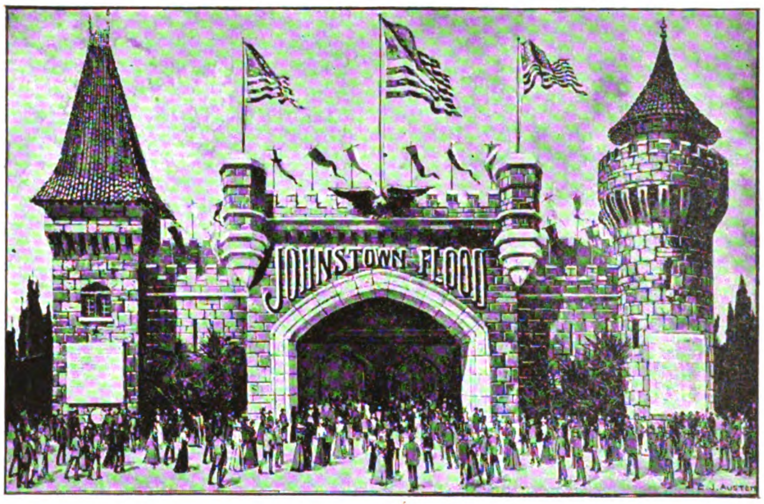
The building covers an area of 109 by 73 feet. its cost is $30,000.

The most vivid scenes of the Johnstown Flood, the accounts of which at the time of the appalling catastrophe electrified the entire civilized world, will be presented in a startlingly realistic manner by means of the scenograph at the Pan-American Exposition at Buffalo next summer. The descriptions of eye witnesses have been followed faithfully by the artist in the portrayal of the scenes. The presentation like the experience of the survivors of the flood is never to be forgotten by those who witness it.

The artistic features of this exhibit have been marked out by Mr. Edward J. Austen, of Newark, N. J., who has had much experience and success, with cycloramic and scenographic productions. Mr. Austen also painted "Niagara-in-Winter," which created a furore in London several years ago.

The scenograph, or living picture, differs from anything of the kind ever used for spectacular productions, and in this respect the presentation of the scenes of the Johnstown Flood will be unique.

The curtain rises upon the city of Johnstown as it was before the devastating flood. It is the even-tide, and the streets are alive with people wending their homeward ways. A passenger train of the Pennsylvania Railroad, in the foreground, dashes past. The sun sinks behind the western hills, and as the shadows envelop the town the lights begin to appear in the windows of the houses. The stars begin to twinkle, and anon the silvery moon sheds her soft radiance abroad. Furnaces and coke ovens in the distance light up the heavens, giving a



startling spectacular effect. A trolley car mounts the hill to the south. The lights in the houses disappear and the city sleeps. The sun rises over the hill-tops and throws its long bars across the scene. Johnstown is again active. Gradually clouds gather in the sky, and

some rain begins to fall, slowly at first, then in torrents, accompanied by thunder and lightning. Suddenly the great dam at South Fork, up the Little Connemaugh, to the east, breaks with tremendous force against it and the water rushes down upon the town, carrying everything before it. The citizens are taken by surprise and many are drowned in the raging torrent. The flood stops at the stone bridge, when the debris piles up and holds the water back. The darkness grows more dense, and soon fire adds its horrors to the scene. All this is brought out very effectively by the scenograph. Finally the scene changes, and the Johnstown of to-day is shown, a busy, thriving town.

Postponed Meeting of the American Institute of Electrical Engineers

The 149th meeting of the A. I. E. E. has been postponed, by direction of the Committee on Papers and Meetings, to Wednesday, January 9, 1901, when it will be held in connection with an Institute dinner at Muschenheim's, 41 West 31st street, at 7 o'clock P. M. The topic for discussion after dinner will be "Electricity in the Last Century and in This." Several eminent members of the Institute will speak upon this subject. The price fixed for dinner is $2.50 per cover.

The council will meet at the office of the Institute at 3 P. M., on the same date.

Applications have been received from the following candidates, which will be acted upon January 25, 1901:

Ermine John Thompson, Pittsfield, Mass.

Charles Tripler Child, Warren Day Brown New York City.

Horace Dowie, Brooklyn, N. Y.

William Edgar Haskins, Worcester, Mass.

Robert Howes, Spokane, Wash.

Carl Price Barnett, Kansas City, Mo.

Harry Philips Davis, Maurice Neville Blakemore, Harve Reed Stuart, Pittsburg Pa.

Henry John Gille, St. Paul, Minn.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended December 26:

Antwerp, 181 packages, $9,759; Amsterdam, 7 packages, $274; Athens, 4 packages, $10; Argentine Republic, 211 cases, $6,916; Bilbao, 23 cases, $717; Bremen, 1 case, $200; 4 packages, $69; Brazil, 363 packages, $14,194; 10 packages electrical railroad material, $1,102; Birkenhead 2 cases, $462; British Possessions in Africa, 107 cases, $9,021; British Guiana, 35 cases, $1,270; British West Indies, 91 cases, $2,910; Central America, 130 packages, $1,666; 2 cases, $255; Chili, 1 case, $14; Cuba, 79 packages, $2,548; 4 cases, $760; Ecuador, 33 packages, $796; Glasgow, 102 cable reels, $42,667; 6 cases, $164; 122 packages, $34,236; Hamburg, 105 cases, $11,993. Havre, 81 cases, $11,874; Hayti, 3 packages, $61; Liverpool, $108 packages, $10,131; London, 268 packages, $21,857; Mexico, 4 cases, $355; Newfoundland, 15 cases, $443; Newcastle, 45 cases, $5,400; Nova Scotia, 11 cases, $124; Peru, 79 packages, $3,375; Portuguese Possessions in Africa, 31 packages, $2,185; Porto Rico, 14 packages, $942; Southampton, 51 cases, $3,153; St. Petersburg, 12 cases, $355; U. S. Colombia, 4 cases, $200; Venezuela, 15 packages, $259; Vienna, 9 packages, $154; Wallsend, 30 packages, $6,392.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The commissioners of Queen Victoria Park, Niagara Falls, Ont., have granted permission to the town of Niagara Falls to develop 100 horse power for town purposes and work will accordingly be commenced at once.

A party of Toronto capitalists recently consulted with Mr. William B. Rankine of Niagara Falls, N. Y., regarding the transmission of electrical power to the city of Toronto. While the details have not yet been made public it is known that arrangements are being made to transmit the power from the American side to Toronto at an early date. The development of power on the Canadian side was also discussed.

Mr. W. J. Hill of Toronto has been for the past eight months engaged in the construction of the works for the reduction plant of the Pittsburg Reduction Company at Shawinigan Falls, Que. Mr. Hill says that the company intends to go into the manufacture of aluminum. This is the first establishment of the kind in Canada, and the Pittsburg company came to this side because of the Canadian corundum deposits. The reduction works, which were built at a cost of $250,000, will be operated by electricity generated at Shawinigan Falls, which are three miles north of the city of Three Rivers, Que.

The negotiations for the purchase of the Metropolitan Electric Railway by the Toronto Railway Company are not yet concluded, and the consummation of the scheme depends upon the action of the city of Toronto. The purchasing company desires that the municipality shall guarantee a perpetual entrance to the city for cars of the various radial lines.

LEGAL NOTE.

A decree for the complainant has been granted in the United States Circuit Court of Boston, in the case of the General Electric Company vs. the Webster & Dudley Street Railway Company to enjoin the defendant from infringing letters patent number 377,996. Claims 1, 2 and 4 are in question.

INCORPORATIONS.

The Arecibo Electric Light & Water Company, East Orange, N. J. Capital stock, $300,000. Incorporators: E. J. McNulty, C. H. Tuttle and P. J. O'Leary.

The Fall Mountain Electric Light & Power Company, Bellows Falls, Vt.—to generate and supply electricity for heat, light and power. Capital stock, $100,000. Incorporators: A. N. Burbank of Brookline, Mass.; W. A. Russell of Lawrence, Mass.; L. M. Reed, J. H. Williams, P. H. Hadley, Z. H. Albee, E. S. Leonard and C. E. Howard, all of Bellows Falls.

The United States Electric Contracting Company, Syracuse, N. Y. Capital stock, $40,000. Directors: David Cronin, F. S. Rogers and E. R. Caldwell, all of Syracuse.

The Domestic Gas Light & Coke Company, New York City —to manufacture gas and electricity for light, heat and power. Capital stock, $100,000. Incorporators: J. Jackson, H. M. Thompson, both of New York City, and G. W. Linch of Montclair, N. J.

The Capitol County Light, Heat & Power Company, Watervliet, N. Y.—to manufacture gas and electricity. Capital stock, $25,000. Incorporators: D. S. Johnston, J. E. MacLean, both of Cohoes; R. Williams, of Watervleit; E. T. Chapman, Jr., of Colonie, and W. R. Condon, of Albany.

The Electro-Pneumatie Company, Hartford, Conn.—to build a pneumatic tube service between Boston and New York, by which a package can be sent between the two cities in twenty-seven minutes. Capital stock, $1,000,000. Incorporators: Charles P. Phillips, Warren K. Dowe, James L. Wolcott, Charles B. Johnson, William C. Case and Percy S. Bryant, all of New York except the two last named.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED DECEMBER 25, 1900.

ELECTRIC RAILWAYS AND APPLIANCES.

664,459. Overhead Electric Trolley. James H. Brown and William H. Tobin, Jr., Pittsfield, Mass Filed July 10, 1900.

664,470. Construction for Third-Rail Electric Railways. William Courtenay, New York City. Filed Sept. 29, 1900.

664,579. Switch for Railways. Fred S. Pearson, Boston, Mass. Filed March 14, 1899.

664,819. Electric Safety Appliance for Railroads. Edward L. Orcutt, Somerville, Mass., assignor to the International Railroad Safety Appliance Company, Kittery, Me. Filed Jan. 3, 1898.

ELECTRIC LIGHTS AND APPLIANCES.

664,554. Regulating Socket for Multifilament Incandescent Electric Lamps. Charles A. Hussey, New York City, assignor to William P. Pinckard, Birmingham, Ala. Filed Aug. 29, 1900.

664,713. Electric-Arc Lamp. Royal E. Ball, New York City, assignor to the Ball Electric Company, Yonkers, N. Y. Filed Sept. 21, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

664,396. Dynamo-Electric Machine. Israel Fisher, Boston, Mass., assignor to Reuel W. Waters, Newton, Mass. Filed April 3, 1899.

664,649. Brush-Holder for Dynamo-Electric Machines. Christian W. Kragh, Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed Sept. 11, 1899.

664,650. Electromagnetic Ore-Separator. Emil Kreuser, Mechernich, Germany. Filed Sept. 2, 1898.

664,733. Method of Converting the Energy of Alternating Electric Currents into Effective Mechanical Energy. Rudolph Eickemeyer, Yonkers, N. Y.; Rudolf Eickemeyer, Jr., Carl Eickemeyer and Mary T. Eickemeyer executors of said Rudolf Eickemeyer, deceased. Filed Nov. 21, 1892.

TELEPHONES AND TELEPHONE APPARATUS.

664,681. Electric Call-Box. Edgar E. Salisbury, Chicago, Ill., assignor to the National Autophone Company, same place. Filed July 24, 1900.

664,691. Telephone-Exchange System. Charles Timberlake, Indianapolis, Ind. Filed Oct. 23, 1899.

664,757. Telephone-Service Apparatus. Uriah S. Jackson, Ossipee, N. H. Filed June 15, 1900.

MISCELLANEOUS.

664,369. Telegraphy. William E. Athearn, New York City. Filed April 5, 1900.

664,371. Electric Heater and Circuit-Controller Therefor. James I. Ayer, Malden, Mass., assignor to the Simplex Electrical Company, Boston, Mass. Filed May 20, 1899.

664,430. Telautograph or Facsimile Telegraph. Anton Pollak, Buda-Pesth, Austria-Hungary. Original application filed Feb. 17, 1899. Divided and this application filed Dec. 21, 1899.

664,432. Insulator. Edward Renault, Waldo, Fla. Filed May 8, 1900.

664,442 Coil for Electromagnets. Severn D. Sprong, Long Branch, N. J., assignor of two-thirds to Charles Getter and William P. Adams, same place. Filed Nov. 29, 1899.

664,503. Collector-Ring. Henry G. Reist, Schenectady, N.Y., assignor to the General Electric Company of New York. Filed March 29, 1900.

664,511. Electric Cut-Out. John H. Trumbull and Henry Trumbull, Hartford, Conn., assignors to the Trumbull Electric Company, same place. Filed April 17, 1899.

664,537. Process of Extracting Copper. James Douglas, New York City. Filed Sept. 22, 1900.

664,550. Electrolytic Treatment of Iron for Preservation Thereof. Henry L. Hollis, Chicago, Ill. Filed Feb. 20, 1899. Renewed May 16, 1900.

664,557. Telegraph-Switchboard. Francis W. Jones, New York City, assignor to the Postal Telegraph-Cable Company, same place. Filed July 16, 1900.

664,594. Means for Transmitting Motion to Distant Points. David P. Thomson, Lynn, Mass., assignor to the General Electric Company of New York. Filed Sept. 29, 1900.

664,667. Electric Push Button. Thomas A. Nathan, New York City. Filed June 1, 1900.

664,679. Accumulator. Louis Renaud, Paris, France. Filed May 24, 1900.

664,761. Printing-Telegraph. Edgar Kinsman, Malaga, N. J., assignor of one half to Alfred B. Richman, same place. Filed Dec. 21, 1899.

664,802. Fire Alarm Telegraph. Leonidas G. Woolley, Kenton, O. assignor to the National Magneto Electric Telegraph Company, Springfield, O. Filed July 20, 1900.

664,807. Electric Advertising Device. Paul Dawson, Detroit, Mich. Filed May 24, 1899.

DESIGN.

33,780. Supporting-Bracket for Telephone Receivers. Edgar C. Peixotto, Augusta, Ga. Filed Nov. 23, 1900. Term of patent 7 years.

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THE TELEPHONE WORLD.

Bell Company Restrained.

A dispatch from Port Huron, Mich., says that Judge Thomas granted an injunction, restraining the Michigan Bell Telephone Company from tearing down its poles and the system of the old Harrison Telephone Company. The injunction was secured by James H. Talbot, a stockholder. It appears that after the Harrison Company was absorbed by the New State Telephone Company, after the latter had secured 175 shares of the total 300 shares of stock, thus securing a controlling interest, the New State Company, in turn, sold out to the Erie system. In some manner the Michigan Telephone Company got control of the 175 shares, and since then, it is alleged, the company has gone on with the work of destroying the old Harrison line without the consent of the other stockholders.

The injunction was asked for with a view to a second suit, which will be commenced, making the New State system, Erie Company and the Michigan Bell Company defendants.

Collector Eugene Knox, of Union Hill, N. J., sold all the poles and wires of the Postal Telegraph Company in that town December 28, at a constable's sale for unpaid taxes. The purchaser was Charles Singer, who bid one dollar, and who now demands that the town turn over to him the property which he purchased. The sale was by virtue of a warrant issued January 17, 1900, by Justice Ruh for unpaid taxes. The companies which are in arrears are the Western Union Telegraph Company, three years, $244.01; Postal Telegraph Company, two years, $151.20, and the Hudson Telephone Company, three years, $82.12. Sale of the poles and wires of the Western Union Company was prevented by an order of the Supreme Court, signed by Justice Collins. The Western Union disputes the assessment levied on its property in Union Hill on the ground that it is excessive. The assessment was $1,500 three years ago and $3,000 each year since. The company holds that it should have been $334.94 and $348.80, respectively. The question of whether the poles and wires are real or personal property is brought up, the assessors holding them as personal. This is a question new to the New Jersey courts. The Hudson Telephone Company last week obtained a reduction of its assessment and paid up, but the Postal refused to make any move except to threaten to put the collector in jail if he should interfere with its property.

The Western Electric Telephone Company of Britt, Ia. recently purchased from the Iowa & Nebraska Telephone Company the entire property of the latter company, the same consisting of 300 miles of telephone line in Northwestern Iowa and Southwestern Minnesota, and also the local telephone exchanges at the following towns: Estherville Sibley, Spirit Lake, Sheldon and Cherokee. The outside limits of the Iowa and Nebraska lines are Estherville, Rock Rapids, Rock Valley, Sheldon, Primghar, Helena, Remsen, Cherokee, Storm Lake, Laurens, Greenville and intermediate points in Iowa, with Bigelow and Ellsworth, in Minnesota. The lines described are a complete wiring of eleven counties in Northwestern Iowa, in addition to the lines that enter Minnesota.

The incorporators of the Franklin County Telephone Company met recently at St. Albans, Vt., and organized under the charter granted at the last session of the State Legislature. By-laws were adopted and the following officers elected: J. H. Abbott, president; Silas W. Flinn, vice-president; M. P. Abbott, secretary and treasurer; V. P. Abbott, auditor; directors: J. H. Abbott, George M. Gleason and M. P. Abbott. The capital stock of the company was fixed at $20,000, which was fully paid in. The business of the company has been most satisfactory for the time it has been in operation in St. Albans. There are now 317 subscribers to the system.

From reliable authority comes the news of the sale of the independent telephone line operated for the last two years by A. J. Robinson of Sanford, Me., in the towns of Sanford, Alfred, Waterboro and Kennebunk of that State. It is understood that the New England will take possession early in the year. The price is not disclosed, but is understood to have been a sum advantageous to Mr. Robinson. The recent ice storms which seriously crippled the independent line with its small repair resources is said to have precipitated the closing of the sale, for some time held in abeyance.

It has been stated on good authority, that the Jacksonville, Fla., Telephone Company and the Bell Telephone Company will soon take down their wires and place them underground. Both concerns are also expecting to erect new exchange buildings and extend their service into the State.

Work has begun on construction of the Corvallis Kings Ore., Valley telephone line.

Duplex Telephony Introduced in Chicago

A practical system of duplex telephoning, by which, using an auxiliary telephone, conversations with two persons may be held simultaneously on the same wire, has been adopted by the Chicago Telephone Company, and instruments for its operation will be put in immediately at many of the big wholesale stores and in offices where the use of the telephone is heavy. The auxiliary telephones will as a rule be used for incoming messages, but they are so arranged that out calls may be made at the same time that the main telephone is in use.

Superintendent Hibbard recently said that the plan had been thoroughly tested and proved a success. By i s use a heavy saving in the running of wires will be made besides more than doubling the capacity of the telephone service to firms using it heavily.

Two telephone companies began with the new year, operating in Pittsburg, Allegheny, Pa., and suburban towns The Central District Printing & Telegraph Company is the Bell connection. It has about 12 000 subscribers in the two cities, while the Pittsburg & Allegheny Telephone Company, a new corporation, has about 6,000. The latter started operations January 1. About 2,000 instruments have been installed in the lower part of Pittsburg, and these have been operated free about one month. The Bell representative asks for an unlimited metallic circuit for business purposes, $125 per year, while the Pittsburg & Allegheny is charging but $48 per year, and for residences $32 per year. The Bell people have a system for residences for which they charge $27 per year. These are party lines, with from two to five subscribers on one line. The new concern charges $32 straight for a single instrument on one wire. The Bell Company also has limited call instruments for which subscribers pay $27 per year for 600 calls and 5 cents per message for all over that number. It has been a difficult battle to get the independent company installed in Pittsburg. Baltimore parties have put up the money for the enterprise from the start. One concern after another failed and the franchises were repeatedly sold.

One hundred and fifty street property owners are at war in Racine, Wis., with the Citizens Telephone Company, a corporation recently organized by local capitalists, who are now putting in the system. The bone of contention is that of placing poles in front of the property. The people have filled up the pole holes as fast as workmen have dug them, and five citizens have secured injunctions restraining the company from putting in poles. Five or six others have placed dynamite cartridges under the ground, and at these places the following signs are up: "Beware! Dynamite cartridges are buried here about 2 feet from the surface. Dig at your peril."

An independent telephone line will shortly connect Memphis, Tenn., with Marion, Ark., the capital of Crittenden County. The promoters of the new enterprise are Charles Barton and Capt. J. A. Gouch. Arrrangements have been perfected for the construction of the line, and work will begin immediately. The river will be crossed by means of a cable, which will be sunk at a point a short distance above the ferry landing. It is the intention of Messrs. Barton and Gouch to continue the line to other important Arkansas towns at a later date.

The Bastin Telephone Company, recently incorporated with a capital stock of $25,000, has purchased the Crab Orchard, Stamford and Mt. Vernon, Ky., lines, the Lancaster exchange and Garrard County lines, including three exchanges and 200 miles of toll lines. The company is already at work putting up lines into new territory and improving its system. It has headquarters at Lancaster and the lines reach into Pulaski, Lincoln, Boyle, Rockcastle, Madison, Garrard, Laurel and other counties.

The Havana Telephone Company, which recently obtained a franchise in Havana and decided to install the Automatic system, is arranging for an exchange of 15,000 'phones and has obtained franchises in Cienfuegos and a half dozen other Cuban ports, some of them previously held by Lewis A. Goudy, of Portland, Me.

The Bell Telephone Company has had for years a monopoly of the business in Ames Ia. The citizens have pleaded for better service, but the Bell turned a deaf ear. Now the citizens have started an exchange of their own, and the Bell Company has awakened only to find it too late.

The citizens of Bethpage, Tenn., have organized and subscribed a telephone subsidy to build from Bethpage to Veto, Ala. The projected line will greatly add to the convenience of the two places, and will be erected at an early date.

From Mountain City, Tenn., news is received stating that the Virginia Iron, Coal & Coke Company is erecting a telephone line from its ore washer at Maymead to ore mines in Doe Mountain. The distance is four miles and the company at first decided to lessen the distance by stringing the wire across the mountain on trees, but fearing that the line would be difficult to keep up on account of falling timber, decided to let the line follow the narrow-gauge ore road.

The Tidewater Telephone Company of Tappahannock, Va., made connection and put in two long-distance telephones a short time ago. As soon as the weather permits the old wires will be pulled down and the new line completed. The line to Walkerton will be repaired. There is talk of extension from Tappahannock in various directions, and it is hoped that ere long direct connection with Richmond will be established.

The board of public works of Kansas City, Mo., lately ordered the new subway company to put its conduits 5 feet below the surface on streets, and 3 feet below the surface in alleys, it having been shown that the company had been placing conduits only 20 inches below the surface. About 1,500 feet of conduits have been laid and the work will have to be reconstructed.

Among the reforms which will be pressed in Denver, Col., when the finance committee take up the consideration of the mayor's budget will be Supervisor Mitchell's scheme for that city to build conduits and force the telephone and telegraph companies to rent space in them.

S. Cottingham has purchased the Central Union telephone plant at Deshler, O., and took possession on New Year's day. He announces that 'phone rental will be 75 cents for residences and $1.50 for offices and business rooms. This will be a great saving over the old rate.

The recently installed service of the Automatic Telephone Company is giving entire satisfaction in New Bedford, Mass. The city is furnished with free telephones and the police department has been cut off from the old system.

A franchise has been granted the Hampden Automatic Telephone Company on condition that the company furnish Westfield, Mass., free service and put such wires as the officials may stipulate under ground.

The Cumberland Telephone & Telegraph Company recently made application to the city council of Versailles, Ky., for a telephone franchise. The action was postponed until January 2.

The city council of Detroit, Mich., granted a telephone franchise to J. W. Martin last week. Mr. Martin claims he will have an exchange in operation with 3,500 subscribers within a year.

The telephone line to Danville, Ala., has been leased by the local company at Hartselle, Ala., and it is now operating the same. A line to Neel has been connected with the Danville line.

The Salem, Ill., Telephone Company has commenced the work of extending its line from Salem to Vernon, via Kinmundy of that State.

L. B. Fulgham is constructing a telephone line from Colmesneil, Tex., to the Lazarus settlement, about twelve miles east of the first town mentioned.

The Carlinville Telephone Company, located at Carlinville, Ill., certifies to an increase of capital stock from $5,000 to $30,000.

The Cane Belt telephone line is now completed five miles below Wharton, Tex., and will reach Bay City as soon as the work can be pushed ahead.

A telephone exchange will soon be established at Nashville, Ind.

TELEPHONE INCORPORATIONS.

The Subscribers' Telegraph & Telephone Company, Watervliet, N. Y. Capital stock, $15,000. Directors: D. S. Johnston and J. E. MacLean, Cohoes, and S. J. Cavanaugh of Watervliet.

The United Telephone & Telegraph Company, Wilmington, Del.—to construct and operate telephone and telegraph lines. Capital stock, $2,000,000. Incorporators: W. D. Barnard, E. Davis, E. M. Yarnall, all of Philadelphia; W. R. Bliss, of Chester, and C. M. Clements, of Sunbury, Pa.

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GENERAL ELECTRICAL NEWS.

Lighting.

Annapolis, N. S.—A poll was held here recently on the electric light question when the rate-payers decided in favor of the purchase of the plant of the Odell Electric Light Company, Limited, for the sum of $8,000.

Au Sable Forks, N. Y.—The J. & J. Rogers Company of this place has put in an electric plant to add to the power of its sulphite mill on the Au Sable River, which is expected to develop 600 horse power, and to furnish sufficient to light the village with electricity.

Berlin, Conn.—The Consolidated Road's electric power plant at this place is to be enlarged to provide for a large increase in electric lighting.

Bethany, Ill.—The village board is discussing the question of erecting an electric light plant.

Bloomington, Ind.—Samuel V. Perrott of Indianapolis has secured an option on the Bloomington electric light plant, and will put in a hot-water heating system here.

Brazil, Ind. One of the improvements to be made this year is the erection of an electric lighting plant with all the latest improved and modern machinery.

Buffalo, N. Y.—The Gowanda Electric Light Company has secured the contract for lighting the streets for the next five years.

Gainesville, Ga.—A. S. Hardy proposes the organization of a company for the establishment of a light and power plant.

Indianapolis, Ind.—A. L. Phillips of this city has made a proposition to establish an electric light plant in Saybrook, Ill.

Kendrick, Idaho.—An electric light plant will be installed in the new flour mill here.

Loveland, Col.—The citizens of this place are agitating the question of erecting an electric light plant.

McKeesport, Pa.—Business men of this city are considering the advisability of organizing a new electric light company. Arrangements are on foot for the establishment of a plant and an option has been taken on a site at Fifth avenue.

McMechen, W. Va.—M. Knapp, C. P. Kinney and J. E. Doyle are interested in the organization of a company to establish a light, heat and power plant.

Memphis, Tenn.—The Memphis Electric Light & Power Company will issue $2,000,000 of bonds for improvements, including its system of conduits which will cost $500,000.. Gen. S. T. Carnes, president.

Minier Ill.—The electric light plant is to be remodeled and enlarged and a new dynamo will be installed.

Nampa, Idaho.—A franchise has been granted here for an electric light plant.

Newark, N. Y.—The village president favors the move now being agitated here for installing an electric municipal lighting plant.

New Haven, Conn.—It is understood here that a combination of New York, Bridgeport and New Haven capitalists has been organized for the purpose of applying to the Legislature this month for the incorporation of an electric light company to furnish light for this city, Milford and Bridgeport.

New Freedom, Pa.—The light committee of this place will receive bids for electric lights to light the town. W. C. Bailey and P. O. Klinefelter, commissioners.

New Sharon, Ia.—The electric light plant here is to be improved and a heating system installed.

Peebles, O.—This village is contemplating the erection of an electric light plant.

Tacoma, Wash.—This city may build an electric light plant. The council committee is investigating the cost of a first-class plant for providing power and light.

Troy, Mo.—This town is agitating the electric light question.

Valley Stream, N. Y.—It is reported here that the electric plant of the Suburban Electric Light Company has been sold to a syndicate of capitalists who propose to put the plant in operation.

Wabash, Ind.—The water system and the electric lighting system was consolidated January 1, both properties being owned by the First National Bank of New York City, which purchased the lighting plant last fall.

Waterloo, Ia.—The lighting plant here has been sold to a new company, which will expend about $50,000 on improvements.

West Plains, Mo.—A new electric light plant will soon be built at this place.

Woodbury, Pa.—The movement by the city council toward the establishment of an electric light plant is meeting with favor among the residents.

Street Railways.

Anoka, Minn.—The St. Francis Electric Railway Company has been organized to build a street railway from St. Francis to the line of Eastern Minnesota known as the cut off. The incorporators are C. Y. and J. S. Woodbury of this place, G. D. Woodbury and others.

Berlin, Wis.—The Wisconsin Midland Electric Railway Company has been incorporated to build a line between here and New London. Capitalists of Appleton are interested.

Danbury, Conn.—The Danbury & Bethel Electric Road will apply to the Legislature for permission to extend its line to the New York State border to connect there with a projected line from the Hudson River by the Peekskill Traction Company.

Defiance, O.—J. J. Frost, who is at work here getting a right of way through the town for the new Toledo-Defiance Electric Railroad, has practically completed his work.

Fordham, N. Y.—By January 15 it is expected that the Mount Vernon and New Rochelle trolley lines will run direct to the terminus of the Third Avenue Elevated at Fordham, and that the fare from New Rochelle to the City Hall will be eight cents.

Hartford, Conn.—Many new trolley lines are projected for this State.

Mankato, Minn.—Minneapolis capitalists are figuring on building an electric street railway here. A local company has a franchise to sell and the deal is likely to be consummated shortly.

Mansfield, O.—The Mansfield, Mount Gilead & Columbus Street Railway Company was incorporated a short time ago for $20,000 to build an electric street railway between the cities named in its title.

New Castle, Ind.—A. D. Ogburn and others have secured a fifty-year franchise for an electric line at this place.

Oskaloosa, Ia.—A franchise has been granted to the Oskaloosa Street Railway & Land Company giving it the right to use the streets for a street railway, a contract to furnish light to the city and the right to operate a heating plant. The company will invest $250,000 within two years.

Paris, Ill.—A. J. Hunter & Co., capitalists of Edgar County, are considering the project of constructing an electric line from this place to Clinton, Ind. The proposed line will be 20 miles in length and will cost about $160,000.

Richmond, Va.—The plans for building an electric line between this city and Petersburg are nearing completion. J. C. Robertson is the local representative of the Chicago men back of the scheme.

Romeo, Mich.—An electric railroad company is being organized here to build a road from Mt. Clemens to this place and Armada. The road is to go through Macomb and Davis to Sellick's Corner and from there to Romeo and Armada. H. N. Taylor is at the head of the project.

Scarboro, Me.—The desire for electric railroad connection with Portland and Saco is again stirring up the citizens of this place, and several petitions setting forth the need of such accommodation are being circulated and signed.

Shelbyville, Ind.—The Indianapolis, Morristown & Rushville Electric Traction Company recently received a franchise from this city for 30 years.

South Hartford, N. Y.—It is said to be a fact that a trolley line will be built from Sandy Hill through this place to Granville in the spring.

Springfield, Mass.—Capitalists are working out a project for the construction of an electric street railway line between Palmer and this city—a distance of 15 miles. The line will connect with the new road from Monson to Palmer, it will give a direct line from Springfield to all the important towns in the eastern part of Hampden County and it will fill one of the two existing gaps in the continuous line of street railway from Boston to Springfield.

Manufacturing.

Cincinnati, O.—The Creighead Engineering Company of this city has been organized for the purpose of manufacturing electrical supplies with a capital of $25,000. T. J. Creighead, J. H. Creighead, C. O. Lyon, A. J. Marsh and S. Zrelonka are among those interested.

Hartford, Conn.—It has been stated that the Perkins Electric Switch Manufacturing Company was about to remove its business to Bridgeport and abandon the factory in this city. This is emphatically denied by the management, so far as the immediate future is concerned, but it is admitted that the business will eventually be removed to Bridgeport.

New York City.—F. W. Tolley and Benjamin Wood, of South Orange, N. J., and C. F. Kinsman, of this city, are the directors of a newly-formed concern known as the Sterling Bronze Company, which has for its purpose the manufacturing of gas and electric light fixtures, with a capital of $20,000.—The John S. Bushnell Company of this city will manufacture electrical and steam appliances on a capital stock of $25,000. A. C. Lippincott of Newark, N. J., H. Spencer, and H. R. Hartt of this city are interested in the firm.

Pittsburg, Pa.—A new manufacturing firm, known as the Langton Electric & Machine Company, has recently been established in this city. The partners are Andrew G. Langton, E. V. Langton and S. M. Cote.

Washington, D. C.—The Capital City Motor Company, having for its object the construction and repair of electric motors, was lately formed. The amount of stock is fixed at $10,000. The trustees for the first year are John A. Miller, Arthus C. Balser and John J. Bell. —The E. F. Brooks Company has been organized for the manufacture, purchase and sale of gas, plumbing and electric fixtures. The officers are Clement M. Biddle, president: Emma Noud, treasurer, and Leo. C. Brooks, secretary.

Company Matters.

Paterson, N. J.—The International Power Company is contemplating the consolidation of its three big plants now situated in Providence, R. I., and Worcester, Mass., and the construction of one factory, at the cost of about $10,000,000, where all the different departments of the industry may be carried on conjointly. If the company succeeds in purchasing the Rogers Locomotive Works, for which it is now negotiating, the new plant will be erected in this city.

Stapleton, N. Y.—At the annual meeting of the stockholders of the Staten Island Electric Railroad, the following were elected directors: Samuel Thomas, W. G. Oakman, W. E. Findley, H. M. Work, J. H. Swinarton E. M. Post, John A. Hilton, D. H. Shea and G. B. M. Harvey.

Automobiles.

Boston, Mass.—It is expected that electric busses will be used on the streets of this city this week.

Chicago, Ill.—The electro motor omnibusses, being constructed by the American Car Company of St. Louis for this city, will carry 40 passengers each, the fare will be 5 cents, and no passenger will be admitted after the seats are filled.

New Haven, Conn.—The New Haven Electric Cab Company will put on Orange street next February five new electric stages for the accommodation of the increasing business of the line in that thoroughfare.

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ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Dec 29						
United Traction....	100	$5,000,000	$5,000,000	1¼ % Q.,	111	112
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa.—Dec 29						
Allentown & Lehigh Val. Trac Co	....	4,000,000	1,500,000	....	--	15
Bridgeport, Conn—Dec 29:						
Bridgeport Traction Co....	100	2,000,000	2,000,000	1 % Aug.,	100	...
Baltimore Md—Dec 29						
a United Rail ways & Elec. Co...com.	50	24,000,000	18,000,000	....	18½	18¾
Boston, Mass.—Dec 29						
New England Street Ry....	25	5,000,000	1,081,925	1 % Q., Jan.15,	...	..
North Shore Traction Co.......com.	100	4,000,000	4,000,000	....	15	16
North Shore Traction Co........pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
b West End Street Ry. Co......com.	50	10,000,000	9,085,00	3½ % S., Oct., '99.	93	93½
West End Street Ry. Co...8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	112	113
Boston Elevated R. R....	100	10,000,000		2¼ % Aug. 99,	156	157
Brooklyn N. Y.—Dec 29						
Brooklyn City Ry....	100	2,000,000	1,928,400	....	239	233
Brooklyn Rap. Transit Co., tr certf..	100	43,000,000	48,000,000	....	85¾	86
cBrooklyn Heights Railroad......	....	200,000	200,000	....	107	109
* dBrooklyn City RR.........guar	100	12,000,000	12,000,000	3½ % Q., Jan.,	287	289
eBrooklyn, Queens Co. & Sub. RR.	....	2,000,000	2,000,000	....	..	..
Coney Island & Brooklyn RR.......	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332
Kings County Elevated....	....	4,750,000	4,750,000	....	--	...
Kings County Traction Co....	100	4,500,000	4,500,000	1 % July	..	..
Nassau Electric Railroad ....pfd.	......	6,000,000	6,000,000	....	75	80
fAtlantic Avenue Railroad....	50	2,000,000	2,000,000	....	--	--
gBrooklyn, B. & W. E. Railroad..	....	1,000,000	1,000,000	....	--	--
Buffalo N. Y.—Dec 29:						
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	....	74	75
*Buffalo Railway Co....	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100
Columbus O.—Dec 29						
Columbus Street Railroad....	100	3,000,000	3,000,000	1 % Q., Feb.	29	30
Columbus Street Railroad, pfd	100	1,500,000	1,500,000	....	90	91
Charleston, S. C.—Dec 29						
Charleston City Ry. Co....	50	100,000	100,000	3 % S.	--	--
Enterprise City RR. Co....	25	1,000,000	250,000	....	--	--
Chicago, Ill.—Dec 29						
Chicago City Ry. Co....	100	12,000,000	12,000,000	3 % Q., Dec. 31, '99.	258	256
Chicago & South Side R. T. RR.....	100	10,823,800	10,823,800	....	..	..
Lake Street Elevated RR....	100	10,000,000	10,000,000	....	9⅛	10
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	31¼	32
Met. West Side El., pfd....	100	15,000,000	9,000,000	....	83½	88¾
North Chicago Street RR....	100	10,000,000	6,600,000	3 % Q., Jan.	209	210
hNorth Chicago City RR....	100	500,000	249,900	....	197	200
South Chicago City Railway....	100	2,000,000	1,603,200	....	99½	100
West Chicago St. RR. Co....	100	20,000,000	18,189,000	1½ % Q., Feb.	98	98½
Union Traction Ry.............com.	....	1,250,000	624,900	35 %	11	12
Union Traction Co. ....pref	100	2,000,000	2,000,000	5 % S.	44	45
Cincinnati, Ohio.—Dec 29:						
Cincinnati Inc. Plane Ry........com.	50	1,000,000	575,000	....	--	--
Cincinnati Inc. Plane Ry.........pfd.	50	150,000	150,000	½ % Feb.	--	--
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2½ % Feb.	75	76
iCincinnati Street Ry. Co....	50	18,000,000	14,000,000	1¼ % Q., Jan.	124½	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1¼ % Q., Jan.	126½	127
Cleveland, Ohio.—Dec 29:						
Akron, Bed. & Clev. Elec. Ry....	100	1,000,000	1,000,000	¾ % Jan.	48	50
Cleveland City Ry....	100	8,000,000	7,600,000	3-5 % Jan.	102	102¼
Cleveland Electric Ry....	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	83	84¼
Detroit, Mich.—Dec 29:						
Detroit Citizens' Street Ry....	100	2,000,000	1,250,000	....	100½	--
Ft. Wayne & Belle Isle Ry....	100	....	1,200,000	....	175	..
Rapid Railway Co....	....	250,000	250,000	....	90	100
Detroit Electric Railway....	...	1,000,000	1,000,000	....	...	..
Wyandotte & Detroit River Ry.....	100	250,000	200,000	....	100	110
Dayton O.—Dec 29:						
City Railway Co.............com.	100	1,500,000	1,470,600	1¼ % Q.	140	145
City Railway Co.............pfd.	100	600,000	600,000	1½ % Q.	170	..
People's Street Railway....	....	1,100,000	1,100,000	....	114	115

*Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h $30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co. $250,100 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

5 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; $525,100 of stock owned by West Chicago Street Railroad Company.

Majority of stock owned by Chicago West Division Railway Company; 5 % on $1,060,-000 stock guaranted by West Chicago Street Railway Company, lessee.

incinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn.—Dec 29						
Hartford Street Ry. Co....	100	$4,000,000	$200,000	3 % S., Oct.,	150	—
Hartford & West Hartford RR	100	1,000,000	247,000	....	--	—
Holyoke Mass.—Dec 29						
Holyoke Street Ry. Co....	100	400,000	400,000	8 % A., June,	207¼	212
Hoboken N. J.—Dec 29						
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %,	150	—
Indianapolis, Ind—Dce 29						
**Indianapolis Street Ry....	...	5,000,000	5,000,000	....	27	29
Lancaster, Pa.—Dec 29						
Pennsylvania Traction Co....	100	10,000,000	9,900,000	....	--	—
Lancaster & Col. Electric Ry.....	....	....	37,500	....	--	—
West End Street Railway....	....	....	....	....	--	—
Louisville, Ky.—Dec 29						
Louisville Ry..............com.	100	4,000,000	3,500,000	1¼ %., April.	82	83
Louisville Ry..............pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1,	12	113
Minneapolis, Minn.—Dec 29						
Twin City Rapid Transit........com.	100	17,000,000	15,010.000	....	68⅜	68½
Twin City Rapid Transit....7 % pfd.	....	3,000,000	1,712,200	1¾ %. Oct.	186	137
Montreal, Canada.—Dec 29						
Montreal Street Ry. Co....	50	4,000,000	4,000,000	8 % S., M. & N.	271	273
Toronto Street Ry. Co....	100	6,000.000	6,000,000	1¾ % S., J. & J. †	107⅞	107¾
Memphis Tenn.—Dec 29:						
Memphis Street Railway Co....	100	500,000	500,000	....	25	—
New Haven, Conn.—Dec 29:						
Fair Haven & Westville RR....	25	2,000,000	2,000,000	3 % S., Sept.	39	41
New Haven Street Railway Co....	100	1,250,000	1,000,000	2½ % A., July	...	...
New Haven & Centerville....	100	700,000	800,000	....	..	—
Winchester Avenue RR....	25	1,000,000	600,000	....	45	46
New Orleans, La.—Dec 29						
Canal & Claiborne RR. Co....	40	240.000	240,000	4 % S., July,	..	..
New Orleans & Carrollton RR....	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	158
New Orleans Traction Co new com.	100	....	....	....	22½	24
New Orleans Traction Co new pfd.	100	....	....	....	95	96
aCrescent City RR............guar.	100	2,000,000	2,000,000	3 % S., Jan.,	20½	26
bNew Or. City & Lake RR....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	..	..
Orleans Railroad....	50	500,000	185,000	1½ %., June,	..	52
St. Charles Street Railway....	50	1,000,000	1,000,000	1¼ %. Oct.,	56½	57
New York—Dec 29:						
Central Crosstown RR....	100	600,000	600,000	2½ % Q.	255	300
cChristopher & 10th Sts. RR..guar.	100	650,000	650,000	2 % Q., Oct.,	175	185
Dry Dock, E. Brdw'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
dMetropolitan Street Ry. Co....	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	171¼	171½
eBleecker St. & Fulton Fy. Ry. guar	100	900,000	900,000	¾ % A., July,	85	87
fBroadway & Seventh Ave...guar.	100	2,100,000	2,100,000	2½ % Q.	232	240
gCen. Park, N. & E. Rivers RR. guar	100	1,800,000	1,800,000	2¼ % Q.	192	200
hEighth Avenue RR....	100	1,000,000	1,000,000	....	390	405
i42d St. & Grand St. Ferry RR. guar	100	750,000	748,000	4½ % Q.	392	402
jNinth Avenue RR..........guar.	100	800,000	800,000	....	198	201
kSixth Avenue RR..........guar	100	2,000,000	2,000,000	....	205	225
lTwenty-third St. R. R. Co..guar.	100	600,000	600,000	4½ % Q.	400	410
Second Avenue RR....	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Third Avenue RR....	100	12,000,000	10,000,000	$1.75 p. sh. Feb.	118	118¼
m42d St., Manhatv'le & St. Nich. Av	100	2,500,000	2,500,000	....	65	75
*Union (Huckleberry) Ry....	100	2,000,000	2,000,000	....	190	200
Newark N. J.—Dec 29:						
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	....	61¾	62
North Jersey Railway Co....	100	6,000,000	6,000,000	....	24½	25½
United Elec. Co. of New Jersey..	100	504,000	504,000	11¾ % A.	23	24
Pittsburg, Pa.—Dec 29:						
Allegheny Traction Co....	50	500,000	500,000	....	27	58
oConsolidated Traction Co....com.	50	15,000,000	15,000,000	2 %, Jan.	27¾	28
Consolidated Traction Co......pfd.	50	9,478,850	9,000,000	3 %, Nov.	64½	65
pCentral Traction Co....	50	1,500,000	‖900,000	1½ % Nov.	72½	73
qCitizens' Traction Co....	50	3,000,000	‡3.00	6 % A.	72¼	72½
rDuquesne Traction Co....	50	3,000,000	‡3,00	6 % A.	..	...
sPittsburg Traction Co....	50	2,500,000	1,90	3½ %, Nov.	. ½	..
Federal St. & Pleasant Valley Ry..	25	1,400,000		2½ %, July,	27	29
Pgh., Allegheny & Man. Trac. Co....	50	3,000,000		2 %, Aug.	..	..
Pittsburg & Birmingham Trac. Ry..	25	1,500,000		1 %, Oct.	41	42½
Pittsburg & West End Ry....	50	3,000,000		5 % A., June	..	..
United Traction Co..........com.	50	17,000,000		J. & J.	15	15¼
United Traction Co..........pref	50	3,000,000		J. & J.	50¾	51

*Unlisted. † Full paid. ‖ Outstanding. ‡ Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 3 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at $215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for $145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1¾ % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Alleg'ny, Cent., Citizens' Duquesne, Fort Pitt & Pitt'h Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on $3,000,000 capital stock.

r Leased to Consolidated Trastion Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock

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PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authoriz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Dec 29						
Union Street Railway Co.	100	$650,000	$350,000	2 %, Feb.	160	165
Northampton, Mass—Dec 29						
Northampton Street Ry	100	300,000	225,000	4 % A., June.	170	173
Omaha, Neb.—Dec 29						
Omaha Street Ry	100	5,000,000	5,000,000	3 % A. and N.	55	65
Paterson, N. J.—Dec 29.						
Paterson Ry. Co.	100	1,250,000	1,250,000	....	54	--
Providence, R. I.—Dec 29:						
United Traction & Electric Co	100	8,000,000	8,000,000	¾ %, Oct. '98.	109	111
Philadelphia.—Dec 29						
Fairmount Park Trans. Co...$50 pd.	50	2,000,000	1,770,000	2 %, Dec. '99.	23	24
Hestonville, Man. & Fairmount	50	1,966,100	‖1,966,100	2½ %, July 15, '99.	47	48
Hest'nvl'e, Man. & Fairm't..6 % pfd.	50	538,900	‡538,900	3 % S—July, '99.	75	76
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3 % Feb. 1, '99.	75	76
Union Traction Co. $12½ pd	50	30,000,000	29,980,450	....	36⅞	37
cElectric Traction Co	50	....	8,297,920	....	..	...
dCitizens' Passenger Ry	50	500,000	†192,500	$8 share Q.	345	..
eFrankford & Southwark Pas. R	50	....	‖1,875,000	$14 sha'e A—Apr.99	450	451
fLehigh Avenue Ry. Co	50	1,000,000	....	....	48	...
fLombard & South Street Ry	25	....	1,000,000	A. & O.	90	90½
dSecond & Third Streets Ry	50	1,060,000	†771,075	$9 share A, Mar. 98	300	...
cPeople's Traction Co	50	10,000,000	†6,000,000	3 %, A., April, '98.	...	..
gGermantown Passenger Ry	50	1,500,000	‖572,800	$5.25 share—1898.	150	151
gGreen & Coates Passenger Ry.	50	500,000	‖150,000	8 % Jan., 1898.	151	152
hPeople's Passenger Ry....com.	25	1,500,000	‖740,000	....	...	...
hPeople's Passenger Ry....pfd.	..	750,000	‖277,402	....	...	...
iPhiladelphia Traction Co	50	30,000,000	‖20,000,000	$2 p. sh., Oct. 98.	97¾	98½
jCatherine & Bainbridge St	50	....	‖400,000	6 % A—Mar., '98.	...	..
jContinental Pass. Ry....guar.	50	1,000,000	‖580,000	$6 share—July, '98.	158	157
Empire Passenger Ry. Co.	50	600,000	‖600,000	....	...	..
jPhiladelphia City Pass. Ry	50	1,000,000	‖475,000	$7.50 share July '98	208	208¼
jPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	$3.50 share July '98	100	..
jRidge Avenue Passenger Ry	50	750,000	‖420,000	$12 share, July '98.	308¾	309
jPhiladelphia & Darby Ry. guar.	50	....	‖200,000	$2 share July, '98.	...	..
j17th & 19th Sts. Pass. Ry. guar.	50	....	‖250,000	1½ % S., July, '98.	..	..
jThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	‖385,000	$11 sh. A., July, '98	300	..
jUnion Passenger Ry. Co.	50	1,500,000	‖900,000	$9.50 shre, July '98	239	240
jWest Philadelphia Pass. Ry	50	750,000	‖750,000	$10 share, July '98	262	263
Rochester, N. Y.—Dec 29						
Rochester Railway Co	100	5,000,000	5,000,000	....	20	23
Reading, Pa.—Dec 29						
jReading Traction Co	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26
kCity Passenger Ry	50	850,000	850,000	Jan., '98.	188	...
lEast Reading Electric Ry	50	1,000,000	‡1,000,000	Jan., '98.	70	--
St. Louis Mo.—Dec 29						
Fourth Street & Arsenal Ry	50	800,000	150,000	....	--	--
Jefferson Avenue Ry. Co	50	400,000	400,000	2 % Dec., 1888.	--	--
Lindell Ry	100	2,500,000	2,400,000	1¼ % Jan., '99.	--	--
National Railway Co	..	2,500,000	2,479,000	1½ % Jan. '99.	--	--
Cass Avenue & Fair Grounds	..	2,500,000	2,500,000	....	--	--
Citizens' RR	100	2,000,000	1,500,000	4 %, Oct., '98.	--	--
St. Louis RR	100	2,000,000	2,000,000	2½ %, Jan., '99.	...	--
Missouri RR	50	2,400,000	2,800,000	1½ % Jan., '99.	--	--
People's RR. Co	50	1,000,000	300,000	50c., Dec., '89.	..	--
United Electric Ry....com.	50	500,000	500,000	....	19	20
United Electric Ry....6 % pref.	100	1,000,000	1,000,000	3 %, Jan., '99.	63	65
St. Louis & Suburban Ry	100	2,500,000	2,500,000	....	68	70
Union Depot RR	100	4,000,000	4,000,000	3 % A., July, '99.	--	--
San Francisco, Cal.—Dec						
California St. Cable RR	100	1,000,000	600,000	50c. monthly.	117	119
Geary Street Park & Ocean RR	100	1,000,000	875,000	$2.50 share, '96.	59	..
Market Street Ry	100	18,750,000	18,750,000	Q., 60c. per share.	61½	68⅛
Presidio & Ferries RR	100	1,000,000	550,000	....	--	16
Scranton Pa—Dec 29.						
Scranton Railway Co	50	6,000,000	2,500,000	....	29	30
mScranton & Carbondale Trac. Co.	100	500,000	500,000	....	16½	...
mScranton & Pittston Traction Co.	100	1,050,000	1,050,000	....	--	--
Springfield Ill.—Dec 29:						
Springfield Consolidated Ry	100	750,000	750,000	....	--	--
Springfield O.—Dec 29						
Springfield Street Ry	100	1,000,000	1,000,000	....	--	11
Springfield, Mass.—Dec 29:						
Springfield Street Ry	100	1,200,000	1,166,700	8 % A.	207	212
Toronto Canada.—Dec 29:						
Toronto Street Ry	100	6,000,000	6,000,000	1¾ % S.	‡108¾	109
Montreal Street Railway Co	.....	4,000,000	4,000,000	4 % S.	272¾	273
Washington, D. C.—Dec 29:						
Belt Ry. Co	50	500,000	500,000	....	..	..
Capital Traction Co	100	‡12,000,000	12,000,000	65c. per sh, Oct. 99.	102⅝	102⅞
Columbia Ry. Co	50	400,000	400,000	6 % A.	--	...
Eckington & Soldiers' Home Ry	50	707,000	652,000	....	35	40
Georgetown & Tenallytown Ry	50	200,000	200,000	....	20	21
Metropolitan RR. Co	50	1,000,000	458,900	2½ % Q.	--	..
Worcester, Mass.—Dec 29						
*Worcester Traction Co....com.	100	8,000,000	8,000,000	....	81¼	84
Worcester Traction Co....6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	105	106
Worcester & Suburban Street Ry	100	550,000	542,500	4½ %, 1899.	...	85
Wilkesbarre, Pa.—Dec 29.						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1%, Jan.,	25	29

* Unlisted. † Paid in. ‡ Full paid. ‖ Outstanding. § Ex-div.

a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6 % on stock per annum.

b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.

c Practically all shares owned by Union Traction Company.

d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.

e Leased to Electric Traction Company.

f Controlled by Frankford & Southwark Passenger Railway.

g Leased to People's Passenger Railway at $5 per share.

h Majority of stock owned by People's Traction Company.

i Leased to Union Traction Company.

j Lease transferred to Union Traction Company.

j Leased to United Traction Company at a rental of $10,000 per annum in 1866-7-8 p.a. $20,000 in 1899-1900 and $30,000 per annum thereafter, payable semi-annually, rental, declared as a dividend semi-annually.

k Dividend of 10 % guaranteed by Reading Traction Company.

l Dividend of 6 % guaranteed by Reading Traction Company.

m Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME	Par	Capital Stock. Authoriz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 29						
American Tel & Tel C	100	50,000,000	25,650,000	4½ % Q., Jan.	154	155
Erie Telegraph & Telephone Co	100	......	......	1 % Q., Feb. 20,	99	100
New England Telephone Co	..	10,894,600	10,804,600	$1.50 p. sh. Feb	127½	128
New York.—Dec 29						
American Telegraph & Cable Co	100	14,000,000	14,000,000	1¼ % Q	91	94
*Central & South Am. Teleg. Co	100	6,500,000	6,500,000	1½ % Q.	100	105
*Commercial Cable Co	100	10,000,000	10,000,000	1¾ % Q.	170	175
Franklin Teleg. Co......2½ % guar.	100	1,000,000	......	1¼ % S.	42	50
Erie Telegraph & Telephone Co	100	5,000,000	4,800,000	1 % Q., Feb.,	..	..
*Gold & Stock Telg. Co..guar. 6 %.	100	5,000,000	......	1½ % Q.	116	118
*International Ocean Tel Co. guar 6%	100	3,000,000	......	1½ % Q.	116	118
Mexican Telephone Co	100	2,000,000	......		8	8½
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2½ % Q., Jan.,	165	170
*Pacific & Atlantic Teleg..guar. 4 %	25	2,000,000	......	2 % S.	70	75
*Postal Telegraph Cable Co	100	15,000,000	15,000,000	1 % Q.	..	..
*Sout'n & Atlantic Telg. Co. guar. 5 %	25	950,000	559,525	2½ % S.	95	100
†Commercial Union Telegraph Co	25	500,000	500,000	3 % S., Jan., '99.	115	..
Western Union Telegraph Co	..	......	97,370,000	1¼ %, Q, Jan. '99.	84	84¼
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—Dec 29.						
American Dist. Teleg. (Phila.)	25	400,000	......	1 % Q.	26	27
Bell Teleph. Co. (of Canada.)	100	3,960,000	3,564,000	2 % S.	188	..
Chesapeake & Potomac Telep. Co.	100	......	......	....	67	70
Chicago Telephone Co	100	......	......	......	200	210
Central Dist Prtg & Telg. Co. (Pgh.).	100	750,000	750,000	....	148	150
Empire & Bay States Telegraph Co.	...	......	......	....	75	76
Hudson River Telephone Co	100	2,000,000	2,000,000	1 % Q.	116	119
*Northwestern Telegraph Co..guar	50	2,500,000	2,500,000	2¾ % Q.	122	125
Providence (R. I.) Teleph. Co	50	.... .	......	....	96½	97
Southern New Eng. Teleph. Co	100	3,000,000	......	....	...	--

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

NAME	Par	Capital Stock. Authoriz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Dec 29						
Fort Wayne Electric trust receipts	..	......	......	....	115	125
Ft. Wayne Elec Co. T. Sec. Series A.	25	......	......	....	15	25
†General Electric Co. [old] .. com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	..
General Electric Co. [new] ...... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	193	193⅛
T.-H. Elec. Co..T. Secur., Series C.	..	......	......	....	22	23
Westinghouse Elec. & Mfg. Co. com.	50	......	146,700	....	53½	54
Westinghouse El. & M'g. Co. pfd.	50	4,000,000	3,996,053	1¾ % Q., Jan.,	64	65
Westinghouse El. & M'g. Co. assent.	50	11,000,000	8,195,126	......	44¾	45
New York.—Dec 29						
Edison Elec. Ill'g Co., New York	100	9,188,000	7,988,000	....	119	120
*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	2,000,000	1½ % Oct., '98.	--	..
Edison Ore Milling Co	100	......	......	....	8	12
Electric Vehicle Co....com.	..	......	......	....	--	--
†General Electric Co. [old]....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1893.	..	...
General Electric Co. [new].... "	100	18,276,000	18,276,000	1½ % Q., Apr., 1900	193	193¾
Interior Conduit & Insulation Co	100	1,000,000	1,000,000	....	41	--
‖Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa—Dec 29						
Allegheny County Light Co	100	500,000	500,000	J. & J.	168	172
East End Electric Light Co	50	300,000	300,000	Q	--	--
Philadelphia, Pa.—Dec 29						
Edison Electric Light Co	100	2,000,000	......	......	144	144½
*Electric Storage Battery Co..com.	100	8,500,000	......	......	80	84
*Electric Storage Battery Co...pfd.	100	5,000,000	......	......	88	90
Northern Elec. Light & Power Co.	10	550,000	550,000	......	13	13½
Southern Elec. Light & Power Co.	10	187,500	187,500	....	30	--
Miscellaneous.—Dec 29						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	......	......	47	48
Missouri-Edison (St. Louis)....com.	..	......	......	....	20	21
Eddy Electric Mfg. Co	25	......	......	....	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	......	....	175	176
Hartford (Conn.) Lt. & Power Co.	25	175,000	......	....	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	......	....	195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	......	2 % Q., Oct.,	98½	99
Rhode Island Elec. Protec. Co	100	......	......	....	118½	120½
Royal Elec. Co. (Montreal)	..	1,000,000	.....	7% Q	‡206½	208
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1¾ % Q	133¾	135
Thomson-Houston Welding Co	100	......	......	3 % S, Dec. 1,	..	100
Woonsocket (R. I.) Electric Co.	100	......	......	....	105	108

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to $20,827,200, of which $18,276,000 is common and $2,551,200 preferred. ‡ Ex div.

‖ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

NAME	Par	Capital Stock. Authoriz'd	Capital Stock. Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston Mass.—Dec 29:						
American Electric Heating Co	50	10,000,000	....	....	--	--
Street Ry. & Illu'g Properties...pfd	100	4,500,000	1,248,700	$2 p. sh.	--	--
United Electric Securities Co...pfd.	100	......	1,000,000	$3.50 p.sh.	--	100
New York.—Dec 29.						
Consolidated Electric Storage Co.	...	......	....	....	8	12
Safety Car Heating & Lighting Co.	100	......	....	......	150	155
Worthington Pump Co....com.	100	5,500,000	5,500,000	......	..	--
Worthington Pump Co....pfd	100	2,000,000	2,000,000	7 % A	109	110
Philadelphia Pa.—Dec 29						
Electro Pneumatic Trans. Co	10	1,500,000	......	--	8	8½
United Gas Improvement Co..scrip.	50	10,000,000	......	--	..	103
Welsbach Commercial Co....com.	100	3,500,000	......	--	20½	21½
Welsbach Commercial Co....pfd.	100	500,000	......	2 % Q	73	75
Welsbach Light Co	5	525,100	......	....	43	43½
Welsbach Light Co., Canada	5	500,000	......	....	1	1½
Pittsburg, Pa.—Dec 29						
Carborundum Mfg. Co	100	200,000	200,000	....	--	..
Standard Underground Cable Co.	100	1,000,000	1,000,000	Q	209	210
Miscellaneous.—Dec 29.						
*Barney & Smith Car Co....com.	100	......	1,000,000	--	13	16
*Barney & Smith Car Co....pfd.	100	......	2,500,000	2 %	94	98
Billings & Spencer Co	25	......	......	....	[illegible]	--
Consol. Car Heating Co	100	1,250,000	1,250,000	1½ % Feb	50	55
Johns-Pratt Co	100	......	......	--	105	109
*Pratt & Whitney Co....com.	100	......	......	--	2	4
*Pratt & Whitney Co....pfd	100	......	......	--	40	[illegible]
Stillwell-Bierce Co....com.	--	......	....	--	--	[illegible]
Stillwell-Bierce Co....pfd.	--	......	......	2 % Sept 1, '99.	50	65
Shultz Belting Co	100	500,000	......	....	[illegible]	[illegible]
St. Charles Car Co	--	......	......	......	[illegible]	[illegible]

*Unlisted.

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BONDS.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Dec 29, 1900

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co......Cons. mtg. 5s.	$500,000	427,500	1930	J. & J.	117¼	....
‡The Albany Ry. Co......Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116½	......
‡Watervleit Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	....
‖Watervleit Turnpike & RR..2d mtg. 6s.	150,000	150,000	1919	M. & N.	*123	......
Troy City Railway Co...............1st 5s	....	....	1942	......	*116½	......

‡Interest guar. by Albany Ry. Co.
‖Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Dec 29, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co...1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102¼
" " " ....income 4s.	14,600,000	....	1949	J. & D.	74¾	75
Baltimore City Pass. Ry..1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118⅞	
†Baltimore Traction Co......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
†Baltimore Trac. Co. Exten. & Imp. g. 6s,	1,250,000	1,250,000	1901	M. & S.	104½	......
†Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121¼
†Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	......
†Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	......
†Central Pass. Ry. Co.........1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	....
†Central Pass. Ry. Co..Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
†City & Suburban Ry.....1st mtg. g 5s.	3,000,000	3,000,000	1922	J. & D.	116	117
†Lake Roland Elev., ...1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	......

☞ All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Lynn & Boston RR........1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.........Deben. g. 5s.	3,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry.......Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Enterprise Street RR.........1st mtg. 5s.	500,000	47,000	1906	J. & J.	... .	....
†Charleston City Ry...........1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry.............1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101¾	2¼
†Chicago Passenger Ry.......1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
‡Chicago Passenger Ry....Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	......	....
¶Chicago & So. Side R. T...1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T...............4½s.	1,500,000	750,000	1907	J. & J.	....	......
‖Chicago West Div. Ry......1st mtg 4½s,	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR..1st mtg. g. 5s.	7,574,000	3,781,200	1928	J. & J.	....	......
Metrop. W. Side Elev. Ry..1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR.........1st mtg. 5s.	3,171,000	3,171,000	1906	J. & J.	106	......
North Chicago St. RR.....Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	......
North Chicago City Ry.......1st mtg. 6s.	500,000	500,000	1900	J. & J.	.	......
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	......
West Chicago St. RR..........1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	......	111
West Chicago St. RR.........Deben. 6s...	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	....	106⅝	107
‡W. Chicago St. RR. Tunnel..1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.
‡Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.
¶Subject to call after Oct. 1, 1899, at $110 and interest.
‖Assumed by W. Chi. RR. Co., lessee.
‡Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Dec 29, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	3,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden P'k In..1st mtg. 6s.	46,000	46,000	1900	A. & O.	103½	104
†Mt. Adams & Eden P'k In...1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	......
†Mt. Adams & Eden P'k Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108¾	......
So. Cov. & Cin. St. Ry.........1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
‡So. Cov. & Cin. St. Ry.........2d mtg. 6s.	400,000	400,000	1932	J. & J.	132¾	137

† Assumed by the Cincin. St. Ry. Co.
‡$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
aBrooklyn Street RR. Co......1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Cin. New't & Cov. St. Ry..Cons. mtg. 5s.	3,000,000	2,500,000	1922	J. & J.	113½	114¼
Cleveland City Cable Ry.....1st. mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
†Cleveland Electric Ry. Co. 1st mtg. g. 5s.	3,500,000	1,249,000	1913	M. & S.	106	107
Columbus (O.) Cent. Ry...1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	......	......
aEast Cleveland RR...........1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	......	107½
Ft. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	....	1922	M. & N.	......	....
Lorain (O.) Street Ry.........1st mtg. 6s.	200,000	200,000	1915	J. & J.	......	....
‡St. Ry. Co., Grand Rapids...1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

†$1,900,000 in escrow to retire bonds of absorbed companies, marked *a*.
‡Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
†Detroit Citizens' St. Ry......1st mtg. 5s.	7,000,000	3,885,000	1905	A. & O.	......	102½
Ft. Wayne & Belle Isle Ry...1st mtg. 6s.	400,000	377,000	1902	A. & O.	....	....
The Detroit Ry.................1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106½

†$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Dec 29, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry.........1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	....
New Haven (Edgewood Div.) 1st. mtg. 5s.	250,000	250,000	1914	J & D	111	......
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M & N	109	......
Winchester Avenue RR......Deben. g. 5	100,000	24,000	1912	M & S	......	....

*With interest. ^a Unlisted.

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Dec 29, 1900.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR.....cons mtg. 6s.	$150,000	†$150,000	1912	M. & N.	......	....
Crescent City RR.............1st mtg. 6s.	....	50,000	1899	M. & N.	106½	......
Crescent City RR.......Cons. mtg. g. 5s.	5,000,000	3,000,000	1942	J. & J.	......	......
New Orleans City RR.........1st mtg. 6s.	416,500	399,000	1903	J. & D.	108	112
†N. Orl's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1943	J. & J.	112	113
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	350,000	350,000	1907	F. & A.	......	......
Orleans Railroad Co.........Cons. mtg. 6s.	300,000	300,000	1912	J. & J.	......	......
‡St. Charles St. RR. Co......1st. mtg. 6s.	300,000	75,000	1906	J. & D.	......	......

†$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
‡$90,000 outstanding.

New York.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn)....Imp. g. 5s.	1,500,000	1,500,000	1934	J. & J.	95	......
Atlantic Av. (Brooklyn). 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
†Atlantic Av. (Brooklyn)..Cons. mtg. 5s.	3,000,000	1,966,000	1931	A. & O.	115	116
‡Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1943	J. & D.	123	125
Broadway & 7th Ave.........1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105¼
Broadway & 7th Ave..........2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface............1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface.............2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co..1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown..1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116
¶Brooklyn, Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.......1st. mtg. 5s.	250,000	250,000	1941	A. & O.	104	......
Brooklyn, Q's Co. & Sub'n..1st mtg 5s.	3,500,000	3,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n..1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit..........gold 5s.	7,000,000	5,181,000	1945	....	100½	......
Bleecker St. & Fult'n Fer'y RR. 1st mtg. 7s	700,000	700,000	1900	....	98½	100½
Cent P'k, N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crosstown RR.........1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	......
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1903	J. & J.	101	108
§D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR..scrip 5 %.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co......Cert. indebt. 6 %.	000 000	1,000,000	1914	F. & A.	106	......
42d St., Man. & St. Nich. Av..1st mtg. 6s.	,200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av..2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	......
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1993	M. & S.	124	125
Metropolitan St Ry Co..g. m. cl. tr. g. 5s	12,500,000	12,500,000	1997	F. & A.	120	......
Second Avenue Ry..Gen. cons. mtg. 5s.	1,600,000	1,600 000	1909	M. & N.	120	121
Second Avenue Ry..............Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.)..........1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co............1st mtg. 5s.	350,000	350,000	1919	....	110½	112½
Third Avenue RR............1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	......	128¼
Twenty-third Street Ry.......1st mtg. 6s.	....	....	1909	J. & J.	.....	....
Twenty-third Street Ry..........Deb. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A	113	116
‡‡Westchester Electric RR...1st mtg. 5s.	500,000	500,000	1943	J. & J.	110	114

†$1,035,000 in escrow to retire gen. mtg. bonds.
‡$4,850,000 in escrow to retire maturing obligations.
¶$552,000 in escrow to retire 1st and 2d mtg. bonds.
§In treasury, $80,000.
‡‡ Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Dec 29, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Montreal St. Ry......................1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
†Toronto St. Ry.............1st mtg. g. 4½s.	4,550,000	2,200,000	1921	M. & S.	....	....

†$35,000 per m. single track authorized. $600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Continental Pass. Ry............1st. mtg. 6s	850,000	810,000	1909	J. & J.	....	....
Empire Pass. Ry....................1st mtg. 7s	300,000	200,000	1900	J. & J.	....	....
Greene & Coates St. Ry..........1st mtg. 6s	100,000	100,000	1898	J. & J.	....	....
Lombard & So. St. Pass. Ry...1st mtg. 6s	150,000	....	1901	....	....	....
People's Pass. Ry...................1st mtg. 7s	250,000	250,000	1905	J. & J.	....	....
People's Pass. Ry...................2d mtg. 5s	500,000	458,000	1911	J. & J.	....	....
People's Pass. Ry.............Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	....	....
People's Pass. Ry.......Stk. trs. cert. g. 4s	5,698,210	......	1943	... ..	....	....
Phila. City Passenger Ry......1st mtg. 5s	200,000	200,000	1910	J &	......	....
Philadelphia Trac. Co.........Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	......	......
Thirteenth & 15th St. Ry........1st mtg. 7s.	100,000	100,000	1903	A. & O	....	....
Union Passenger Ry...............1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
§Union Traction Co................Col. tr. 4s.	29,785,000	29,724,876	1945	A. & O.	....	......
West End Passenger Ry........1st mtg. 7s.	....	......	1905	......	....	....
West Phila. Pass. Ry.........1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	......	....
West. Phila. Pass. Ry............2d mtg. 5s.	750,000	750,000	1926	M. & N.	......	......

§ The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.

Pittsburg. Pa.

Date of Quotation—Dec 29, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Birmingham, Knox & Allentown......6s.	500,000	500,060	1931	M. & S.	111½	....
Central Traction Co................1st mtg. 5s.	875,000	875,000	1930	J. & J	......	......
Citizens' Traction Co.............1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	......	......
*Duquesne Traction Co.........1st mtg. 5s.	1,500,000	1,500,000	1930	J. & J.	.....	......
*Fed'l St. & Pleas. Val. Jack's Run.....5s.	50,000	50,000	1918	J. & J.	......	......
Fed'l St. & Pleasant Valley........Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	......	....
Millvale, Etna & Sharpsburg..............5s.	750,000	750,000	1928	M. & N.	110	118
Pittsburg, Crafton & Mansfield...........5s.	250,000	250,000	1924	J. & J.	......	....
Pittsburg Traction Co............1st mtg. 5s.	750,000	750,000	1927	A. & O.	......	
Pittsburg & Birmingham......1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	113
Pittsburg & West End.........1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	......
*Pg'h., Allegh. & Manch.....Gen. mtg. 5s.	1,500,000	1,400,000	1930	A. & O.	....	......
Second Ave. Traction Co.....................5s.	2,500,000	2,033,006	1934	J. & D.	......	....
Sub. Rapid Transit Railway Co..........6s.	500,000	500,000	1912	M. & S.	......	....

Providence R. I.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Newport Street Ry..................Coupon 5s	50,000	50,000	1910	J. & D.		
United Trac. & Elec. Co.....1st mtg. g. 5s	9,000,000	8,260,000	1933	M. & S.	116	118

St. Louis.

Date of Quotation—Dec 29, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Baden & St. Louis RR.........1st mtg. 5s.	250,000	250,000	1913	J & J	101½	102½
Cass Ave. & Fair Gds Ry......1st mtg. 5s	1,818,000	1,818,000	1912	J & J	101½	102½
Citizens' Railway Co.......1st mtg. 5s.	2,000,000	1,500,000	1907	J & J	109	
Comp. Hts. Un. De. & Mer. Ter...1st	1 000 000	000 000	191	J & J	17	

*With interest

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PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Bid.	Asked.
St. Louis.						
Date of Quotation— Dec 29, 1900						
Jefferson Avenue Ry............1st mtg. 5s.	400,000	400,000	1906	M. & N.	103	105
¶Lindell Ry. Co....................1st mtg. 5s	1,500,000	1,500 000	1911	F. & A.	108	109
Missouri RR. Co....	1,000,000	700,000	1916	M. & S.	105	106
‡Mound City RR. Co.............1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co....................1st mtg. 6s.	125,000	125,000	1902	J. & D.	....	......
‖People's RR. Co....................2d mtg. 7s.	75,000	75.000	1902	M. & N.	......	......
People's RR. Co................Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	......	......
St. Louis & E. St. L. Electric..1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....................1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
§St. Louis & Sub. Ry.........1st mtg. g. 5s.	3,000,000	1,400,000	1921	F. & A.	103	104
St. Louis & Sub. Ry...............Income 5s.	800,000	800,000	......	....	80	84
††Southern Electric Ry....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
¶Taylor Avenue St. Ry......1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.........Cons. mtg. 6s.	3,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
‡Controlled by Union Depot RR. Co.						
¶Controlled by Lindell RR. Co.						
‖$200,000 in escrow to retire 1st & 2d mtg.						
§$600,000 in escrow.						
††$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation— Dec 1900.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	......	117
Geary St., Park & Ocean RR..1st. mtg. 5s.	1,000,000	671,000	1921	A. & O.	......	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	......
†Metropolitan Ry. Co.................1st mtg.	200,000	....	......	....	....	......
†Omnibus Cable Co................1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	......
†Park & Cliff House RR........1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR..................1st mtg. 6s.	250,000	250 000	1914	J. & J.	115	......
†Powell St. Ry.......................1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co...............1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	....	......
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Dec 29, 1900						
Belt Ry. Co..........................Cons mtg 5s.	500,000	450,000	1920	J. & J.	......	....
Columbia Ry............................ mtg. 6s.	500,000	500,000	1914	A. & O.	132	......
Eckington & Soldiers' Home. mtg. 6s.	200,000	200,000	1911	J. & D.	......	......
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	......	......
†$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation— Dec 29, 1900						
Bridgeport Traction Co........1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co......Cons. mtg. 5s.	5,000,000	3,543,000	1931	F. & A.	118	. ..
†Citizens' St. R. (Ind'polis).1st cons.m.5s	4,000,000	3,000,000	1933	M. & N.	104	105
‡Crosstown St. Ry. (Buffalo)..1st. mtg.5s.	3,000,000	2,366,000	1932	M. & N.	112	113
¶Columbus (O.) St. Ry......1st cons. g. 5s.	3,000,000	2,261,000	1932	J. & J.	115	
Consolidated Traction (N. J.)..1st mtg.5s	15,000,000	13,965,000	1933	J. & D.	111¼	111⅜
‖Crosst'n St. Ry. (Colu's, O.)..1st mtg.g.5s	2,000,000	572,000	1933	J. & D.	115	115½
Denver City Cable Ry........1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	..
Denver Con. Tram'y Co......Con. m. g. 5s.	4,000,000	922,000	1933	A. & O.	80	85
Louisville (Ky.) Ry...1st cons. mtg. g.5s.	6,000,000	4,931,000	1930	J. & J.	119	119½
§Minneapolis St. Ry..1st cons. mtg. g. 5s	5,000,000	4,050,000	1919	J. & J.	110¼	110¾
††No. Hudson Co. Ry. (N.J.).Cons.mtg. 5s	3,000,000	2,378,000	1928	J. & J.	108	......
No. Hudson Co. Ry. (N.J.)..2d mtg. 5s.	550,000	550,000	1928	M. & N.	....	......
No. Hudson Co. Ry. (N. J.).......Deb. 6s.	500,000	489,000	1902	F. & A.	....	......
Paterson (N. J.) Ry.......Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	....	......
Rochester (N. Y.) Ry............1st mtg. 5s.	3,000,000	2,000,000	1930	A. & O.	......	......
St. Paul City Ry.......................Cons. g. 5s.	5,500,000	4,298,000	1937	......	105½	106
St. Paul City Ry........................Deb. g. 6s.	1,000,000	1,000,000	1900	......	108	....
†$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
‡$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
¶$760,000 in escrow to retire bonds of C. O. St. RR. Co.						
‖$87,000 in treasury.						
§$960,000 res'ved to redeem prior liens						
††$620,000 in escrow.						
					*With int'res	

ELECTRIC LIGHT AND ELECTRICAL MFG. COS

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Boston, Mass						
Date of Quotation—Dec 29 1900						
Delaware Gas Lt. Co.,... ....1st m. 5s, g.	800,000	800,000	......	J. & J.	106	108
Edison Elec. Illuminating Co., Boston....	2,026,000	......		Quar.	157	...
General Electric Co..gold coup, deb. 5s..	10,000,000	3,750,000	1922	....	116	......
Pittsburg Pa						
Date of Quotation—Dec 29, 1900						
Allegheny County Light Co........ ......6s.	500,000	......	1911	J. & J.	110	......
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	......	......	M. & S.	....	......
Miscellaneous.—(Dec 29, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	......	109	......
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1993	......	124	......
Edison Elec. Illg. Co. (Brooklyn).......	5,000,000	5,000,000	1940	....	122½	124
Edison Electric Light (Philadelphia)..	2,000,000	......	...	......	. ..	......
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500.000	......	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s	5,176,000	....	1997	A & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	....	......	F. & A.	102½	......
United Elec. Light & Power Co (N. Y.)..	5,000,000	......	....	......	....	....

TELEPHONE AND TELEGRAPH.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 29 1900						
American Bell Telephone......................4s.			1908	F. & A.	100½	101
Northwestern Telegraph Co.................7s.	....	....	....	....	....	.
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s	......	....	....	....	114	115
Chesapeake & Potomac Teleph. Co...5s.	....	......	1911	J. & D.	108	106

ALLIED INDUSTRIES.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Miscellaneous.						
Date of Quotation—Dec 29, 1900						
American Electric Heating .... 7s.	500,000	500,000	....	....	....	......
Armington & Sims Engine Co..............	....	....	......	......	......	25
Barney & Smith Car Co.......................6s.	....	....	1942	J. & J.	106	107
Carborundum Mfg Co........................6s.	....	....	1904	J & D.	......	......
Worthington Pump Co........................	75,000	....	....	....	115	127

Unlisted †Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16¾@16⅞c.; Lake, 16⅞@17c.; casting, 16⅝@16¾c.

The Syracuse (N. Y.) Rapid Transit Company has voluntarily advanced wages 7 to 9 per cent.

The United Railways & Electric Company (Baltimore) bonds are being rapidly absorbed by investors.

The gross car earnings of the Twin City Rapid Transit Company of Minneapolis for the third week of December show an average of $839 per day.

The new 4 per cent. bonds of the Third Avenue Railroad Company have been admitted to the unlisted department of the New York Stock Exchange.

The Mexican Telephone Company has declared a quarterly dividend of 2½ per cent., payable January 15. Books close January 8 and reopen January 16.

The general tone of the market for copper is steady, and no broad movement is apparently under way to influence market values sharply one way or the other.

The Central & South America Telephone Company has declared a quarterly dividend of 1½ per cent., payable January 8. Books closed December 28 and reopen January 9.

At 12:45 o'clock Monday morning the street car strike at Scranton, Pa., which was inaugurated a week ago, was called off. The men demanded what was equivalent to an advance of three cents an hour. They were allowed two cents and a ten-hour day.

A mortgage was recorded in the county clerk's office at Plainfield, N. J., Saturday, given by the Elizabeth, Plainfield & Central Jersey Traction Company to the Fidelity Trust Company of Newark. The mortgage is for $2,500,000 and is to run for fifty years at 5 per cent.

George von L. Meyer has retired from the presidency of the New England Electric Vehicle Transportation Company, as he is about to fill his post as Ambassador to Italy. Francis R. Hart, vice-president of the Old Colony Trust Company of Boston, has been elected president of the Electric Vehicle Transportation Company.

The Philadelphia "Stockholder" says: "Everybody will be surprised if Metropolitan Street Railway interests are not represented in the board of directors of the Brooklyn Rapid Transit Company, which is to be elected January 25, for everybody believes that the Metropolitan capitalists will not care to postpone longer the formal announcement of their connection with that system."

Mr. Alexander Cochrane, president pro tem. of the American Telephone & Telegraph Company, has no hopes or intentions of becoming the permanent president of that company. The directors of the company are giving the matter of the selection of a permanent president considerable attention, and at a special meeting of the board recently the subject was discussed at considerable length but without arriving at a decision.

The total income of the street railways in the State of Pennsylvania the past year was, according to the State Bureau of Railways, about $2,000,000 in excess of the previous year. Dividends amounted to $5,427,500. The total number of passengers carried was 538,194,532; total taxes paid, $1,579,284; total capital stock, $103,176,121; funded debt, $38,975,100; current liabilities, $11,585,004; total assets, $156,368,465.

At a recent meeting of stockholders of the Massachusetts Electric Companies it was voted to issue at once $2,700,000 4½ per cent. coupon notes for the purpose of purchasing stock in the sub-companies, recently authorized by the Railroad Commissioners, and retire floating debt. The indenture also provides for an additional issue of notes to the amount of $800,000 to purchase, in the future, stock of sub-companies that may be issued for improvements under the plan of consolidating the properties.

Henry Hart, formerly president of the Third Avenue Railroad Company of New York and his friends have completed negotiations whereby they will secure funds to "call" from James R. Keene and a pool of Wall Street brokerage houses the block of Third Avenue stock taken from Mr. Hart a year ago in order to protect him from the then impending crash. One of the provisions of this arrangement was that Mr. Hart had the right to take back his stock at any time within a year.

The figures of the Manhattan Elevated Railway Company of New York, as given in the annual report to stockholders, support the contention of those connected with the company that the passengers carried for 1901 will probably reach 190,000,000, a figure that has not been touched since 1894. This increase in travel should not mean any large increase in expense, pending the installation of electricity, for in 1893 the company handled 30,000,000 more passengers than this with 1,000,000 less train mileage.

The Brooklyn "Eagle" says: "The personnel of the board of directors of the Brooklyn Rapid Transit Company to be chosen in January has been agreed upon and will show some changes. Since the annual report $1,000,000 floating debt has been paid off without increasing the funded debt with money largely received from committees engaged in the reorganization of the Kings County Elevated and Brooklyn Elevated. The company has nearly $1,000,000 cash surplus in its banks, but no dividend is expected until July."

The New York "News Bureau" states that the rumor is again rife that the People's Gas Company of Chicago has made some arrangement with the Edison Company and to this report the rise in the stock is attributed. Officials of the gas company, when asked concerning the matter, said that only the friendly feeling which is of long standing existed and that no closer alliance had been formed. President Insull, of the Chicago Edison Company, met the inquiry with his usual attitude of indifference, pleaded ignorance of the story and remained non-committal about the probabilities of such a step.

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JUL 16 1900

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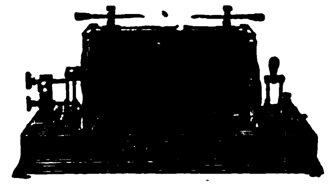

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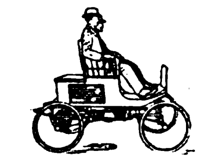

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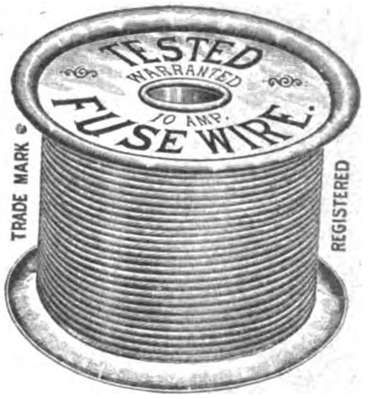

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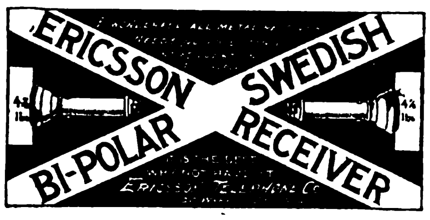

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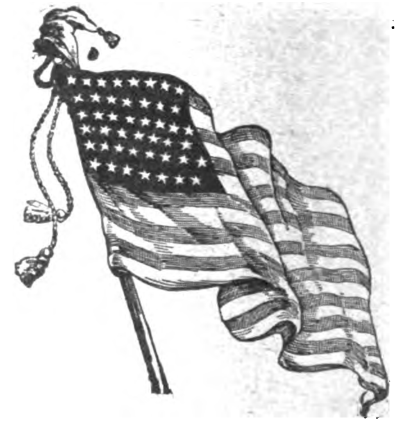

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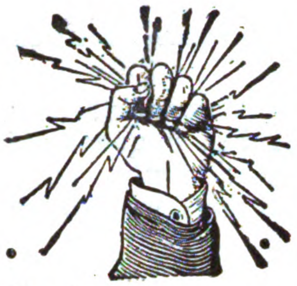

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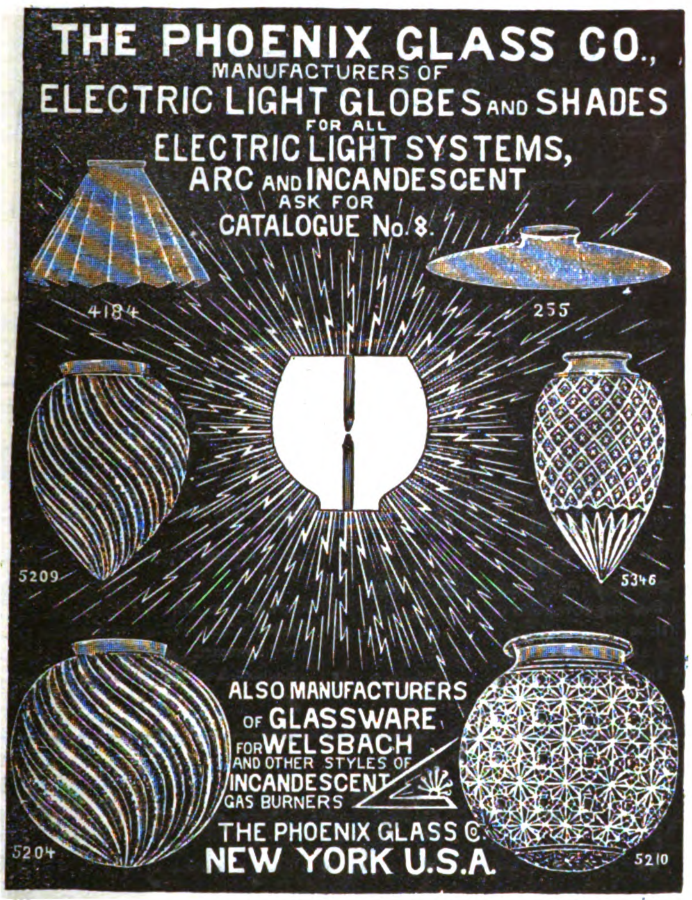

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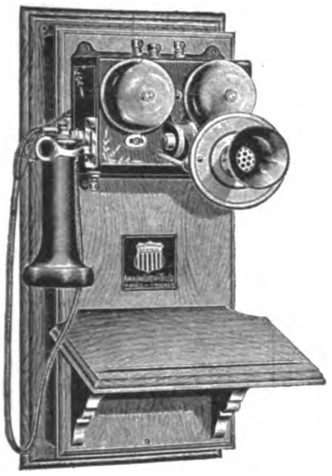

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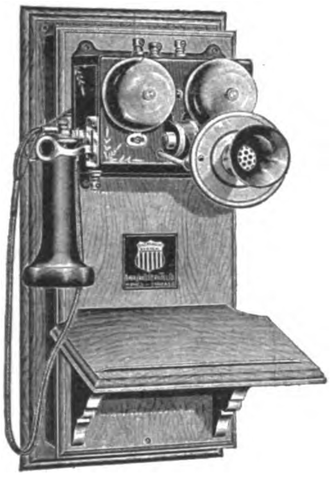

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" 37. Shows the connections and station instruments required for the process of throwing generators in parallel, and operating them continuously, as used extensively in this country.
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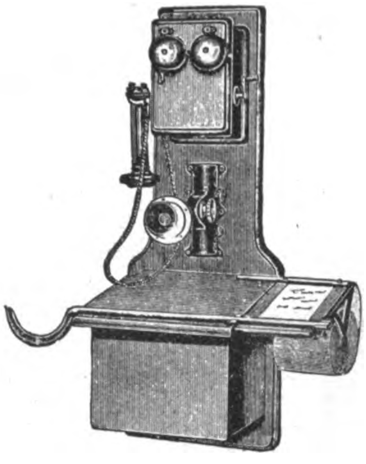

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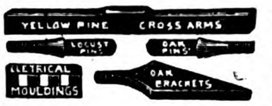

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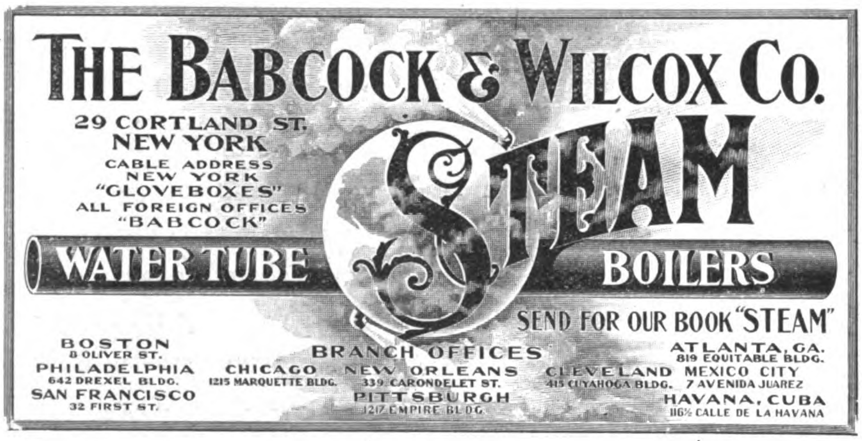

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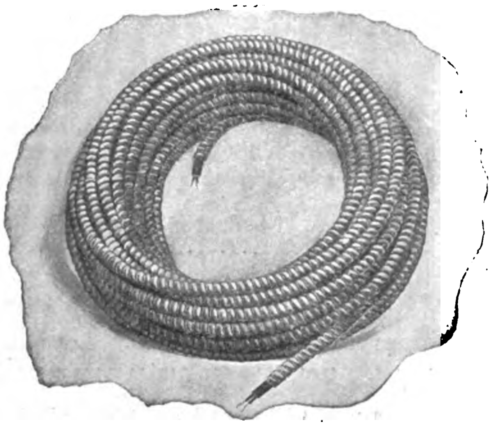

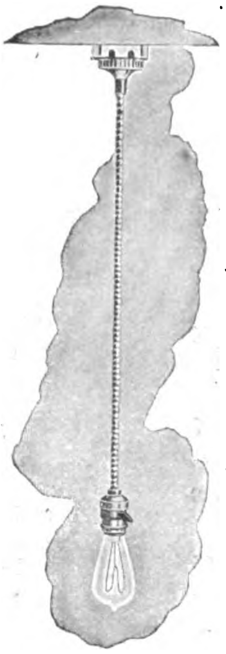

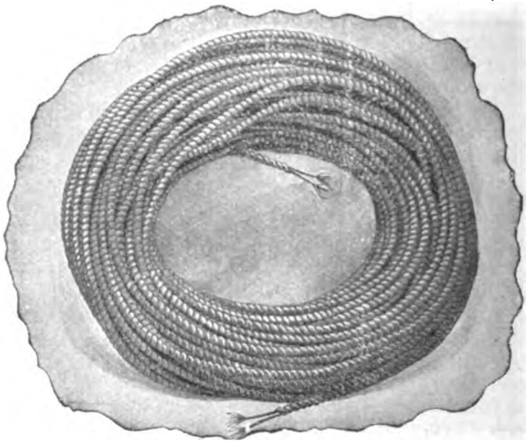

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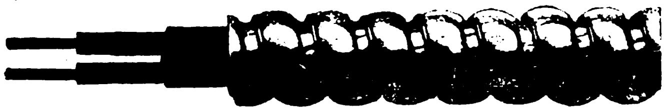

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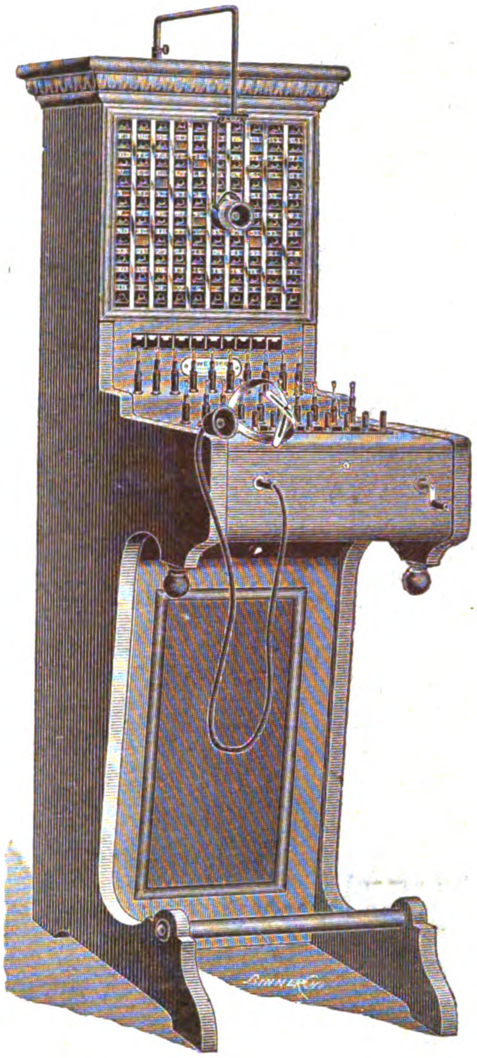

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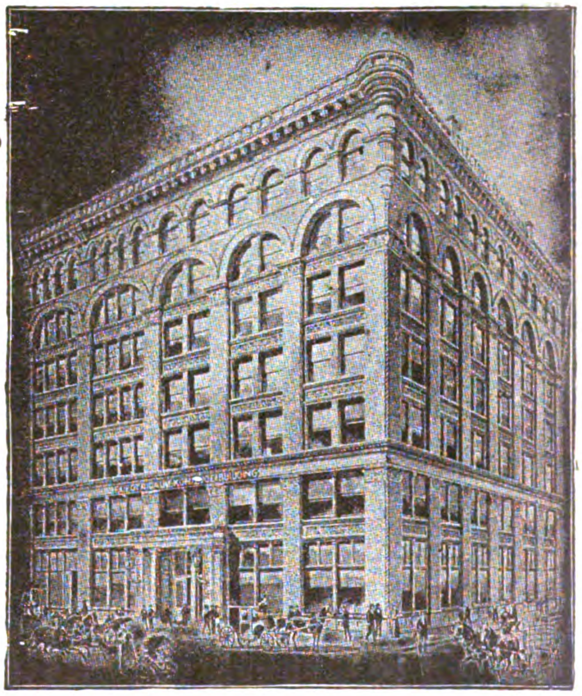

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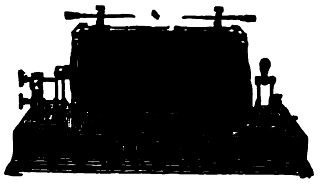

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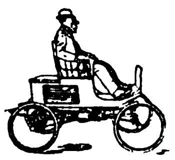

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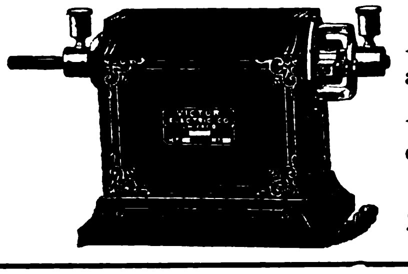

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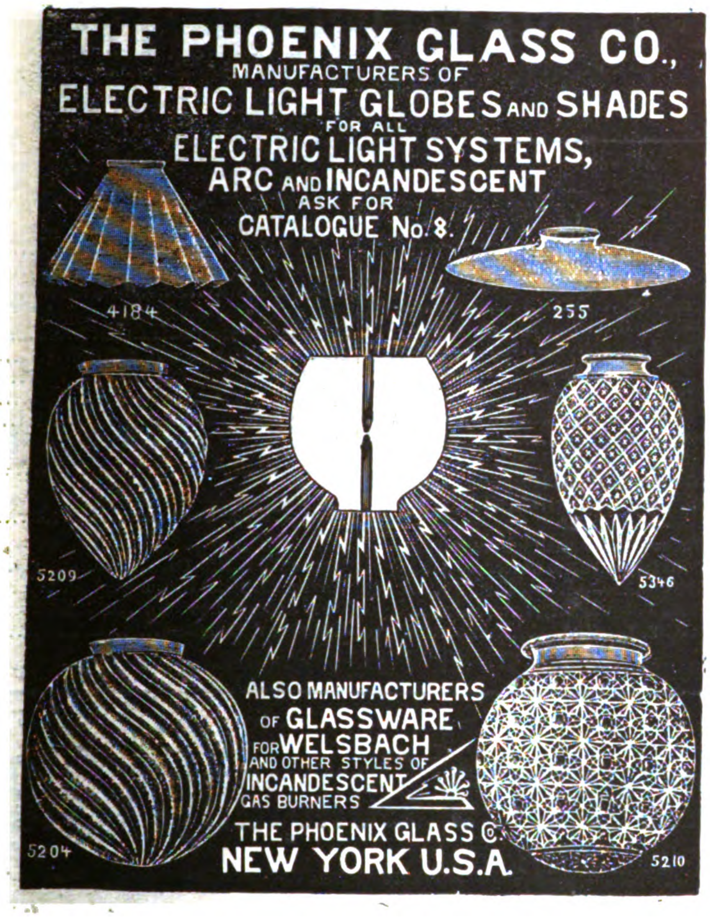

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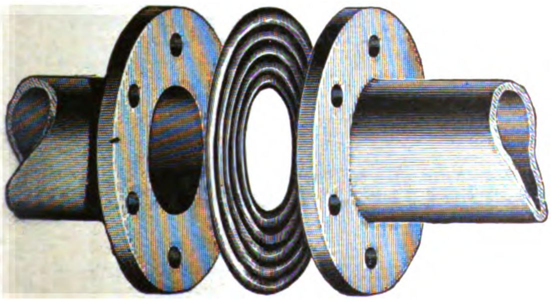

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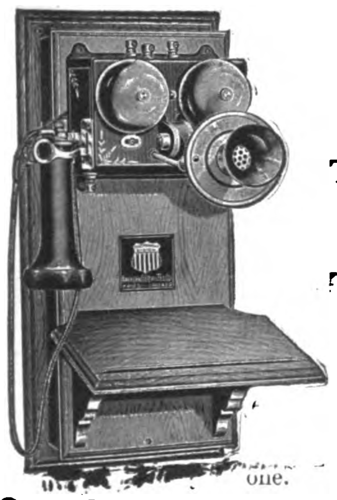

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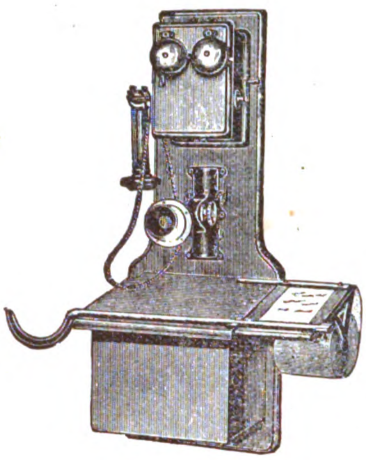

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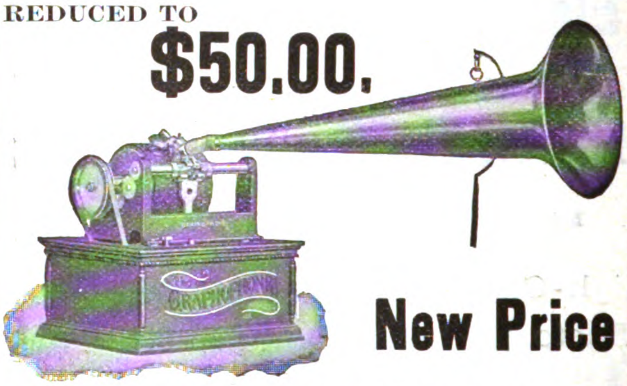

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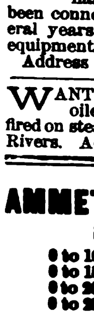

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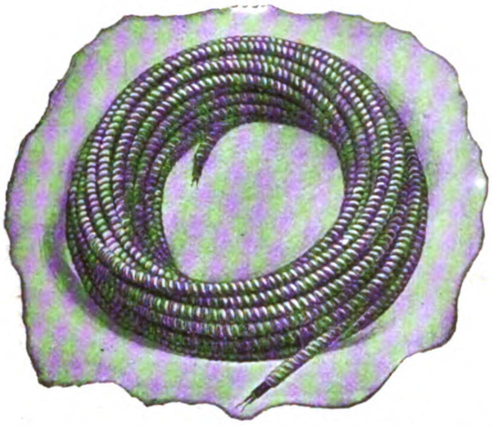

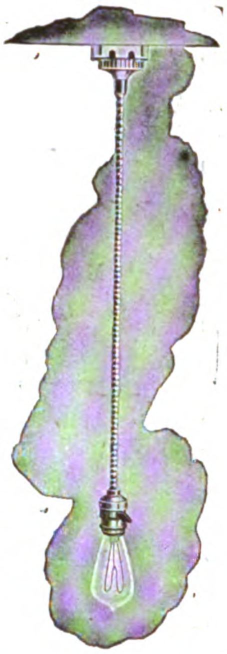

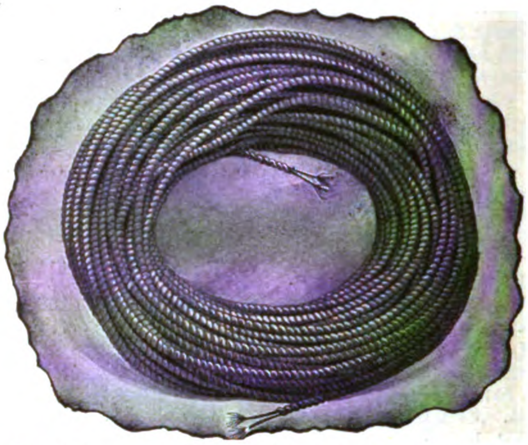

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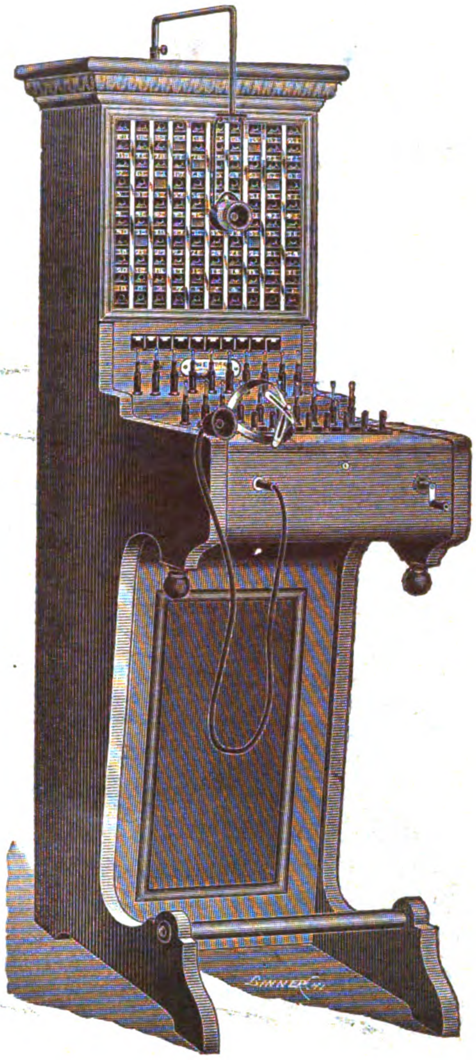

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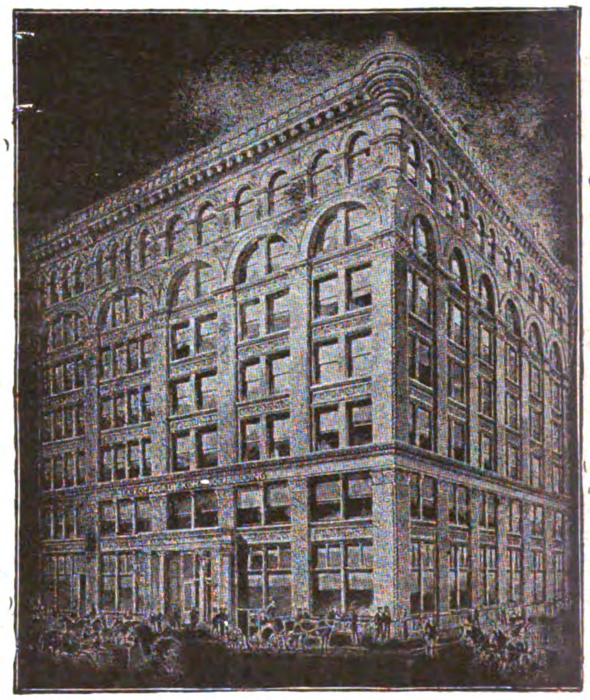

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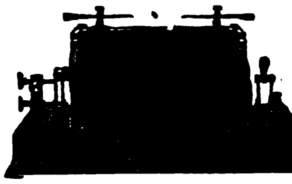

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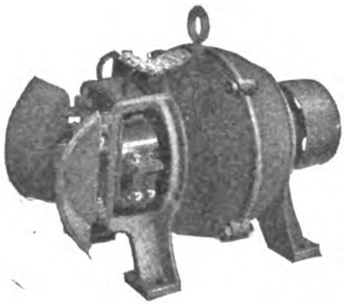

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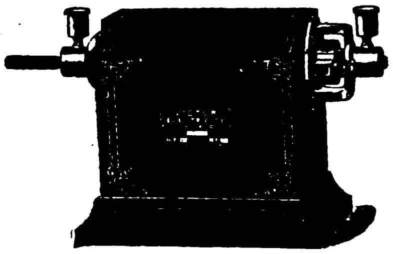

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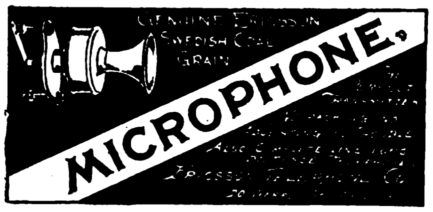

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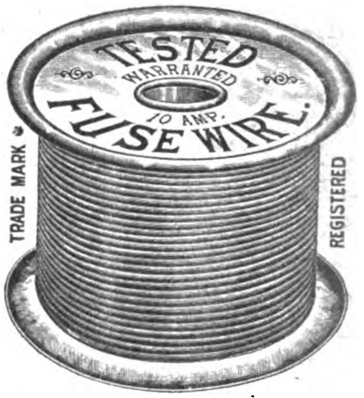

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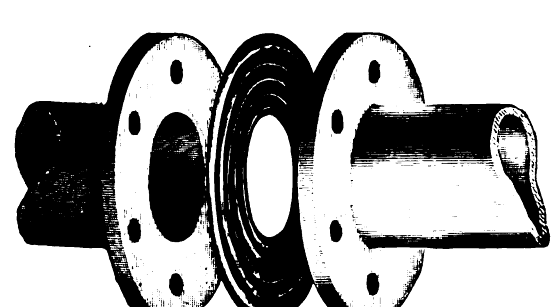

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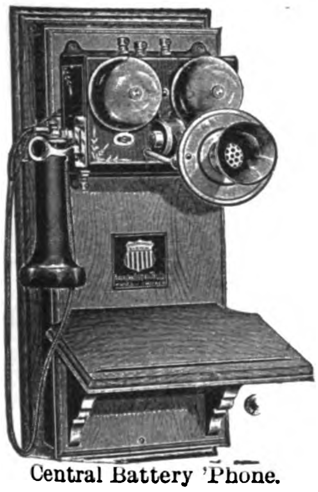

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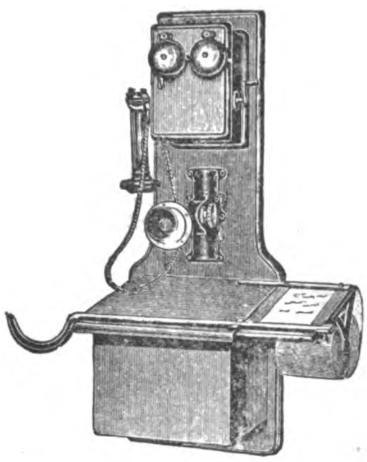

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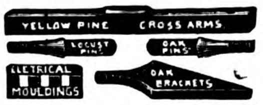

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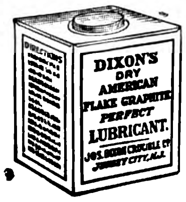

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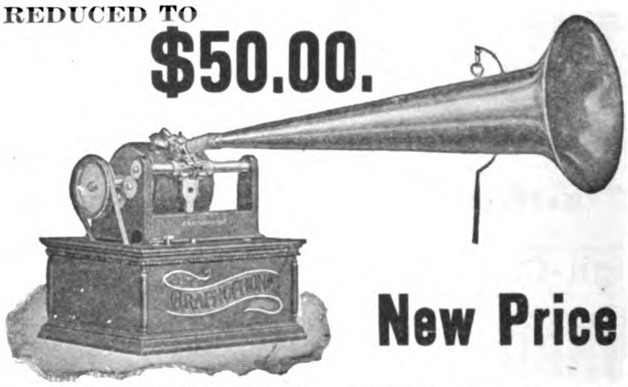

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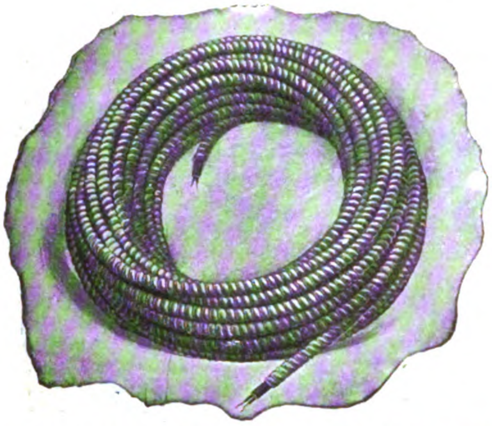

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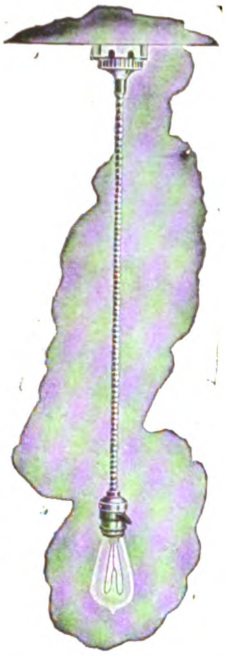

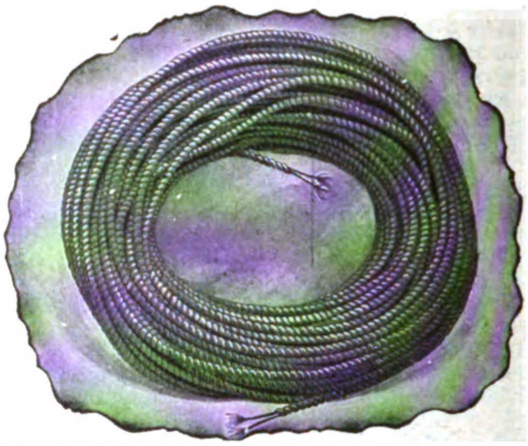

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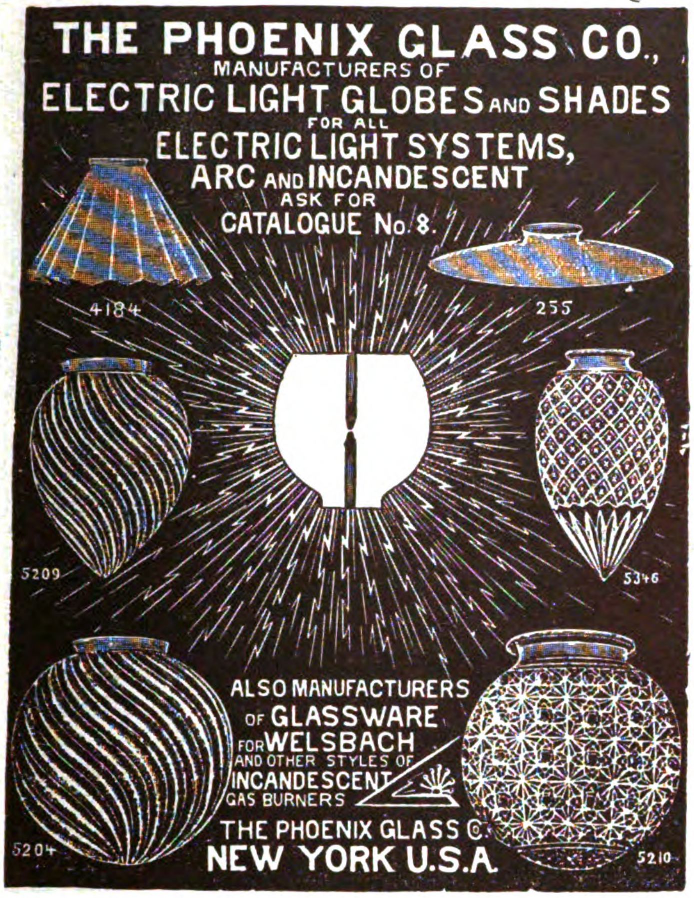

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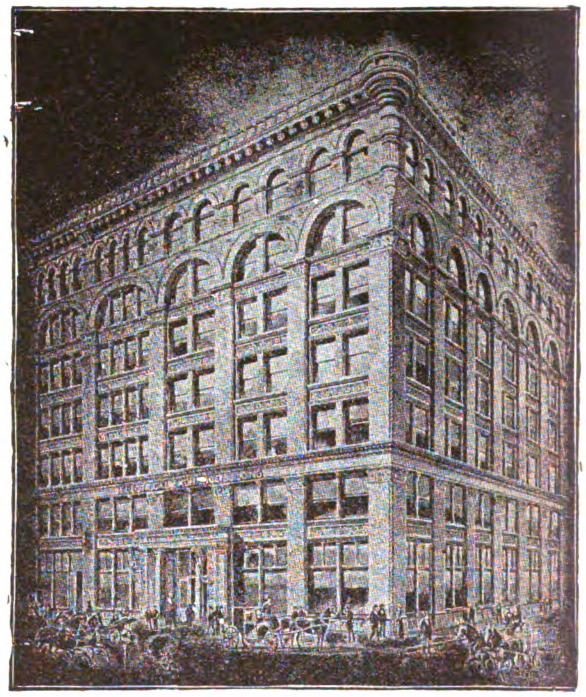

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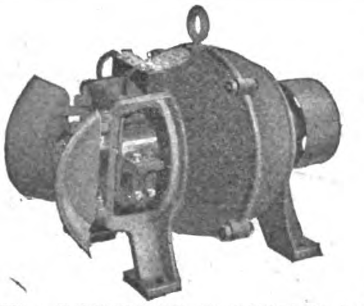

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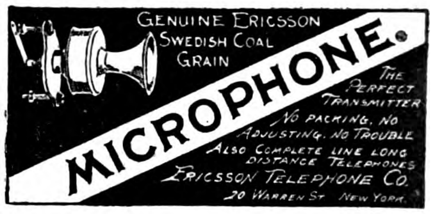

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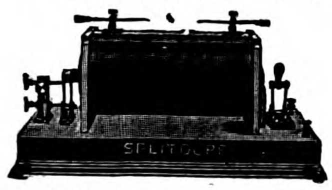

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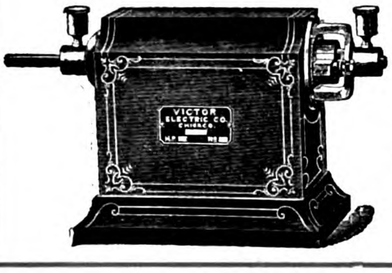

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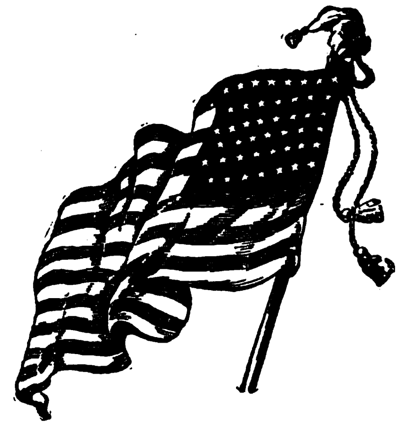

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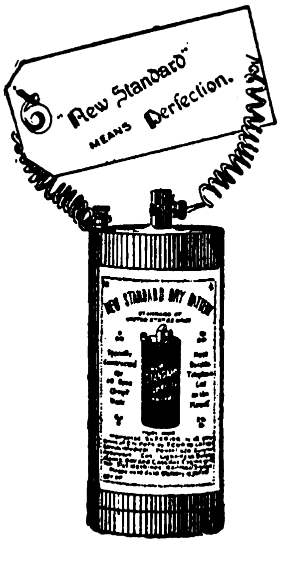

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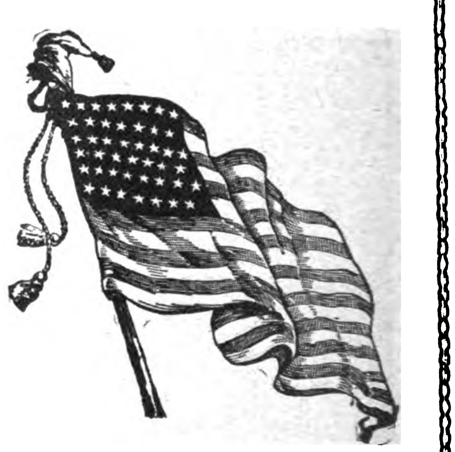

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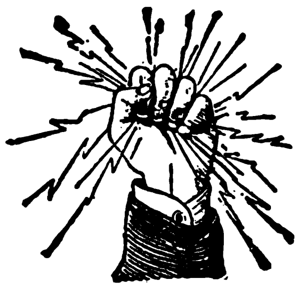

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With kind feeling, I have the honor to remain,

Very truly yours,
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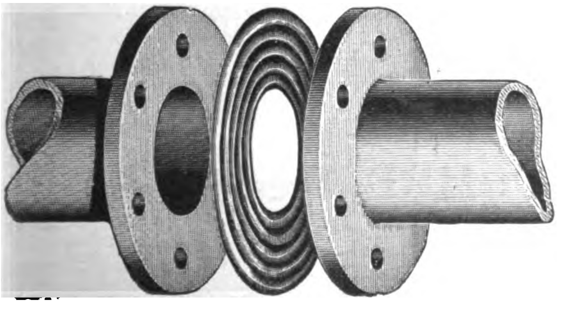

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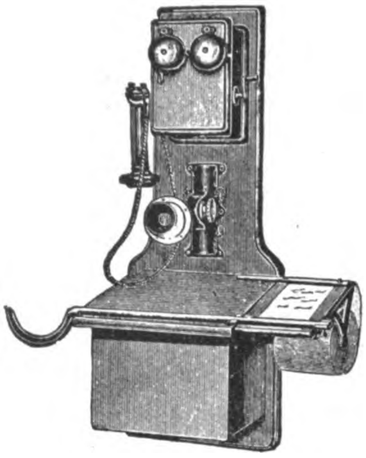

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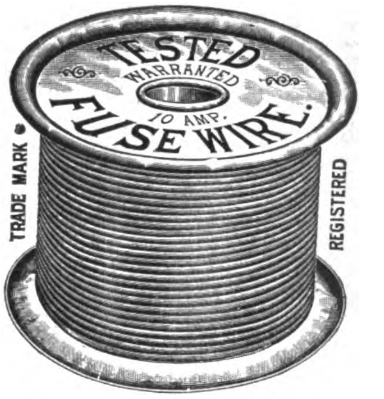

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Lecture Notes on the Theory of Electrical Measurements. 12mo, cloth. New York, 1898.... 1.00

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Magnets and Electric Currents. An Elementary Treatise For the Use of Electrical Artisans and Science Teachers. 12mo, cloth. New York, 1898.... 3.00

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NOLL, AUGUSTUS.
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Local Distribution of Electric Power in Workshops, etc. Illustrated. 8vo, cloth. London, 1897.... 1.00

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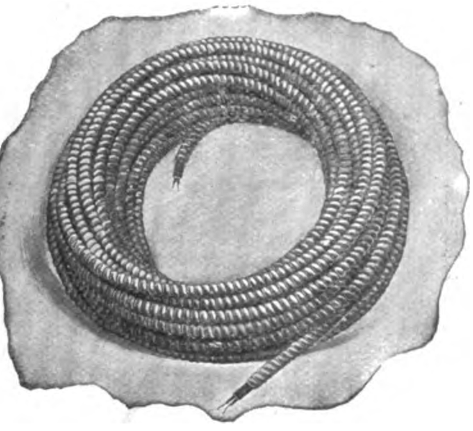

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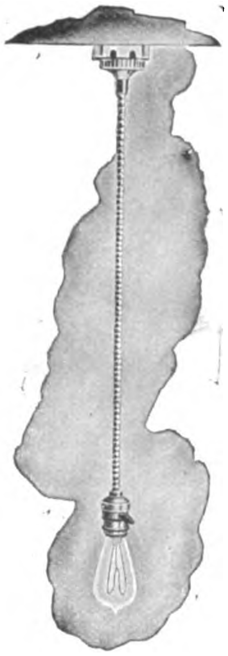

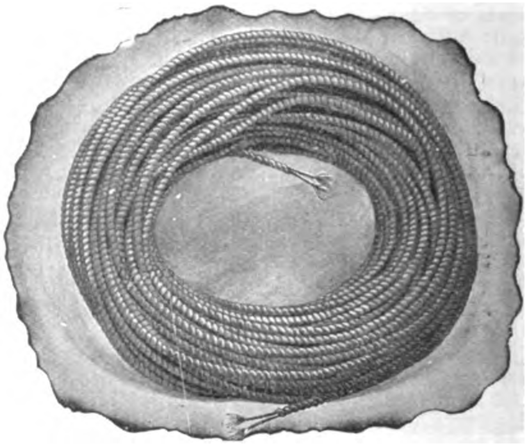

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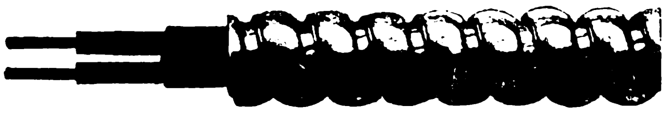

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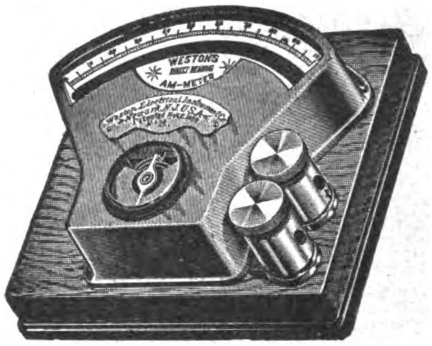

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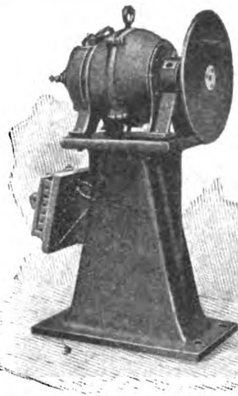

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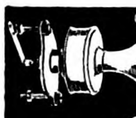

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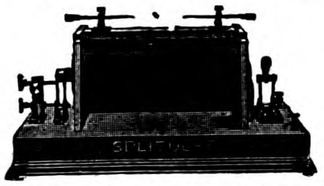

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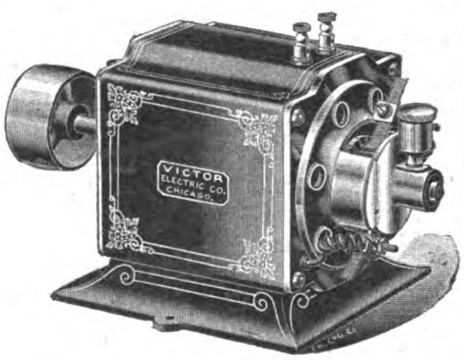

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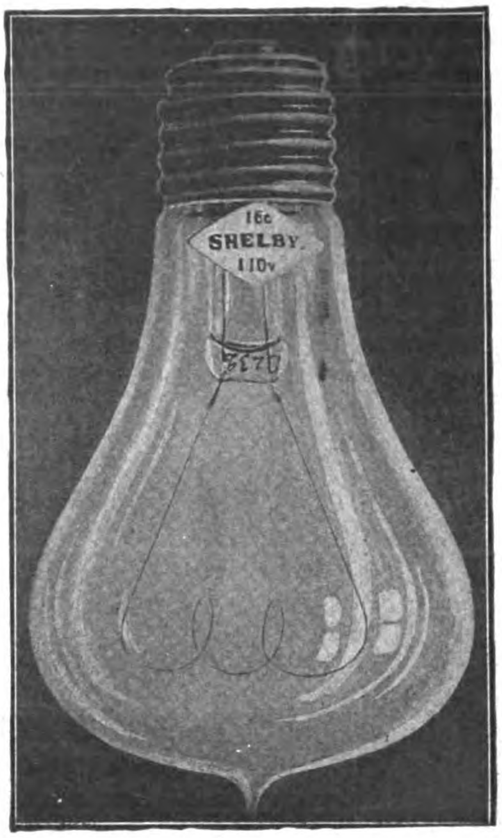

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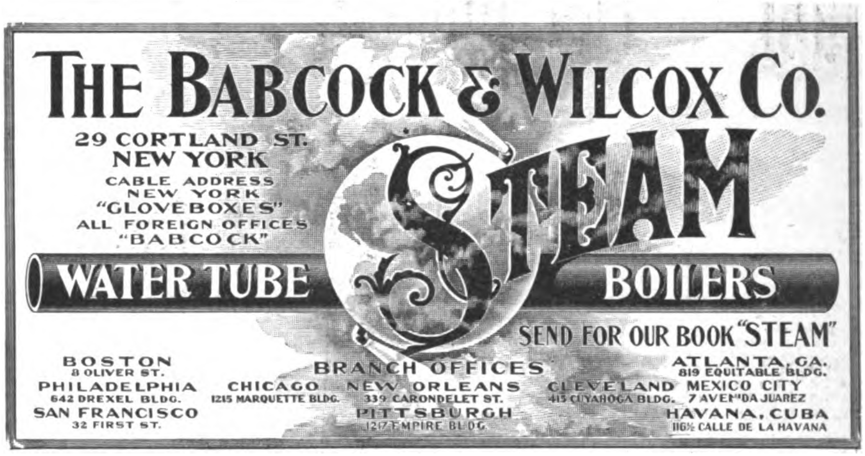

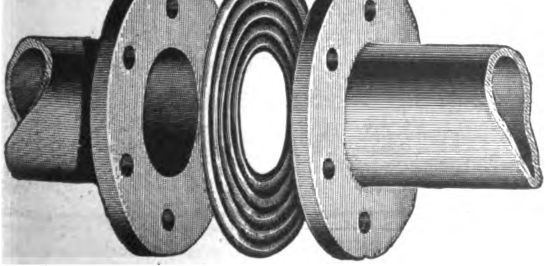

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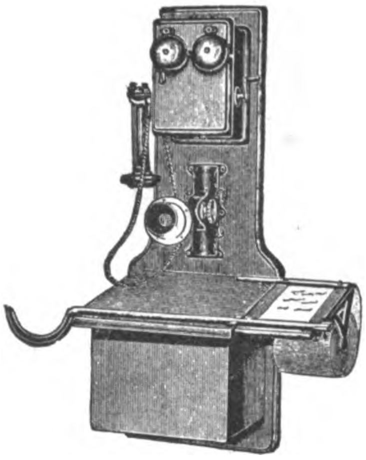

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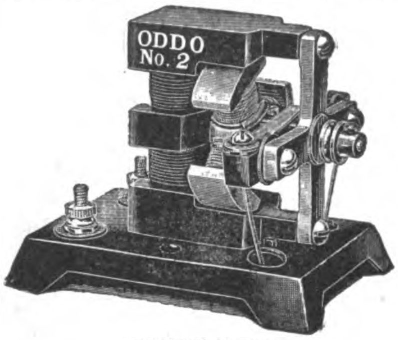

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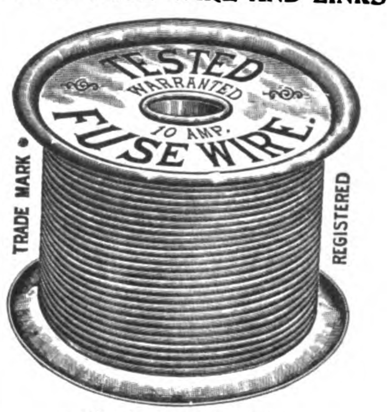

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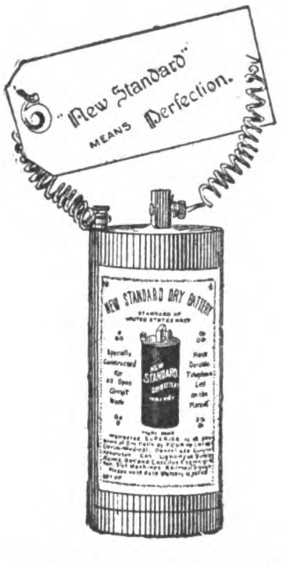

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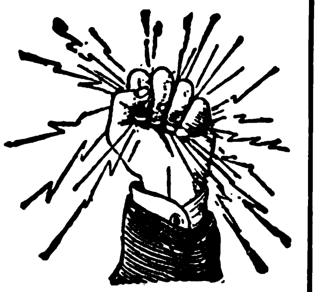

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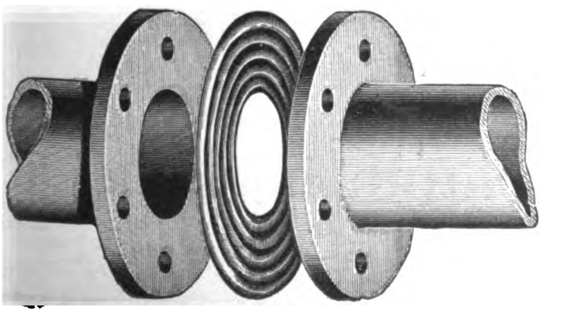

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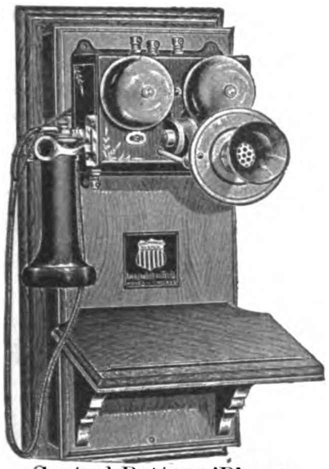

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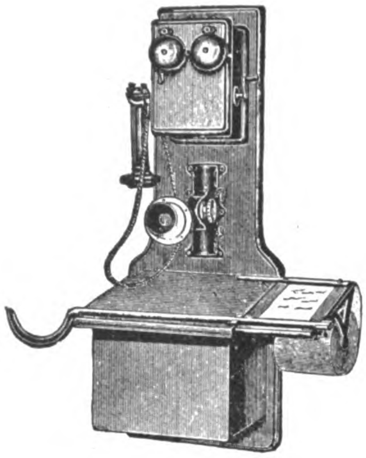

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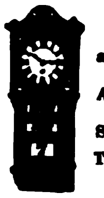

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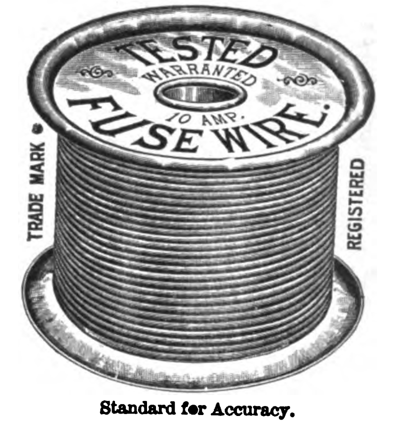

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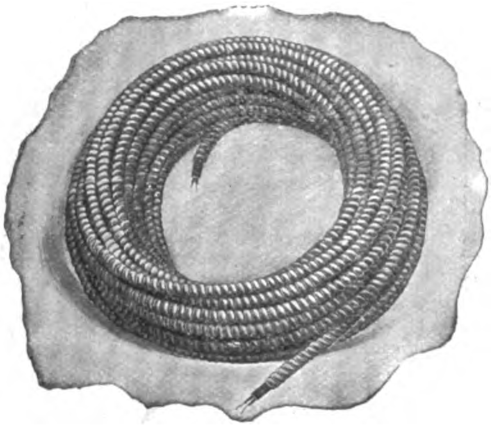

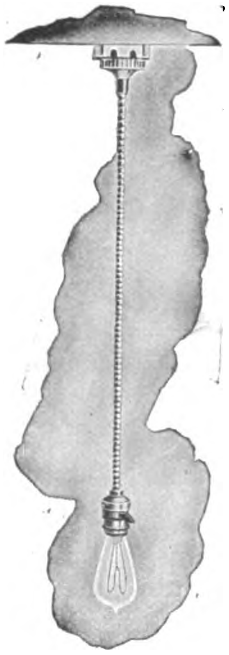

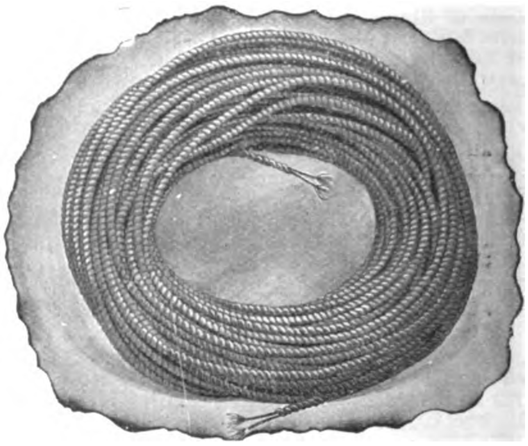

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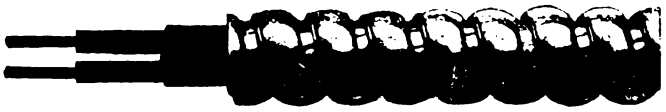

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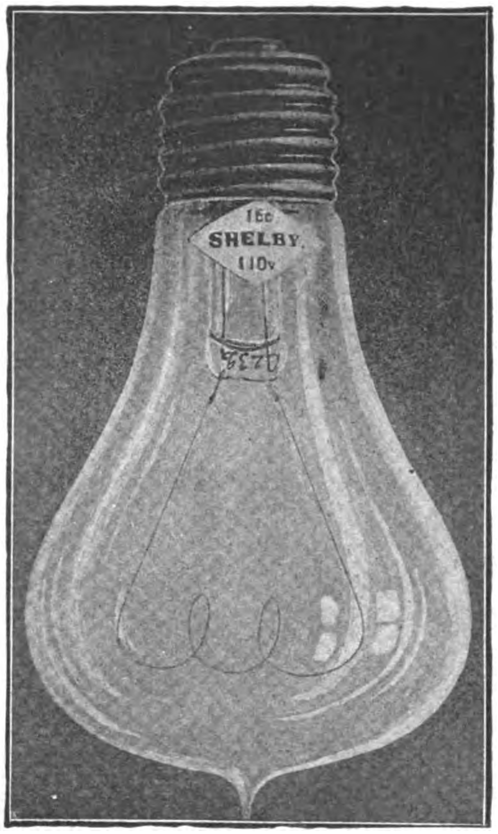

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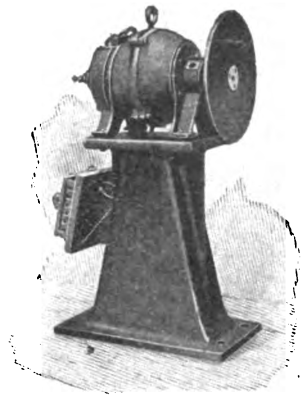

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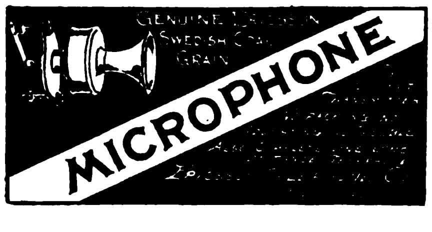

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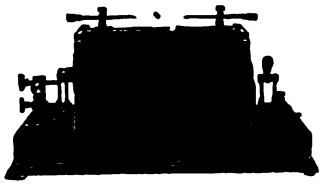

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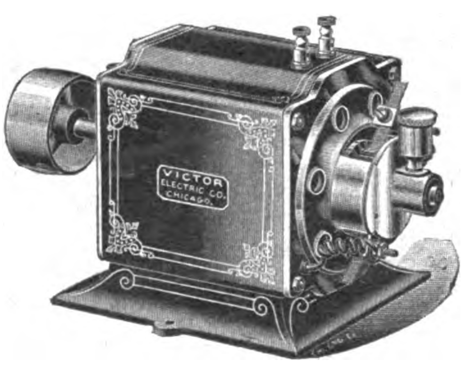

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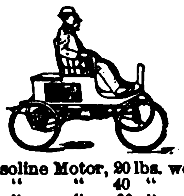

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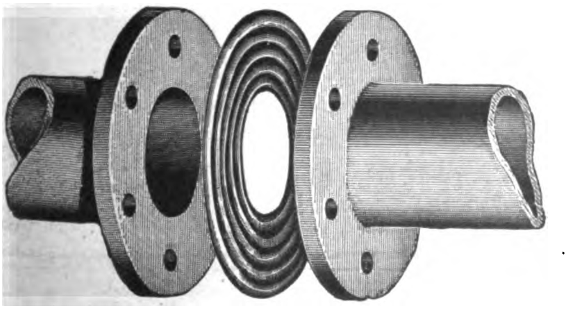

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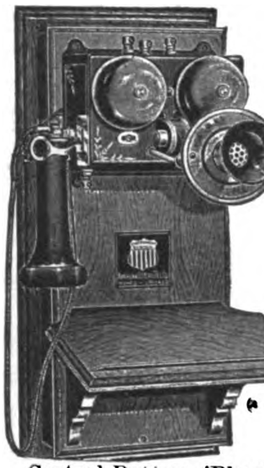

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This book is intended to be used, primarily, in connection with instruction on courses of electrical engineering, in institutions for technical education. It is intended equally as much for the general reader, as well as a book of reference for engineers.

The first two chapters are devoted to a brief but logical discussion of the electrical and magnetic laws and facts upon which the operation of this class of machinery depends.

CONTENTS.

CHAPTER I.—Electrical Laws and Facts. II.—Magnetic Laws and Facts. III.—Armatures. IV.—Field Magnets. V.—Operation of Armatures. VI.—Efficiency of Operation. VII.—Constant Potential Dynamos. VIII.—Constant Current Dynamos. IX.—Motors. X.—Series Motors. XI.—Dynamoters, Motor-Generators and Boosters. XII.—Management of Machines. XIII.—The Design of Machines. XIV.—Tests.

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PARTIAL LIST OF DIAGRAMS.

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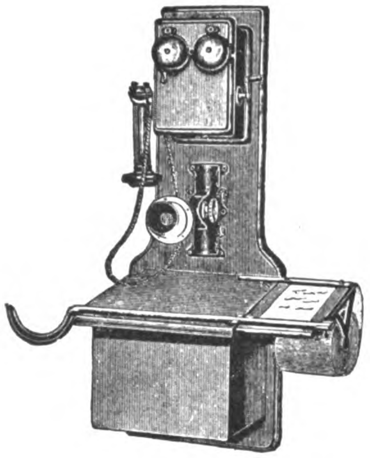

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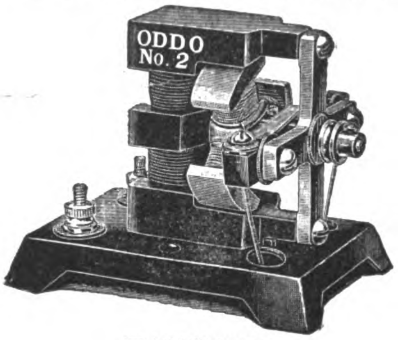

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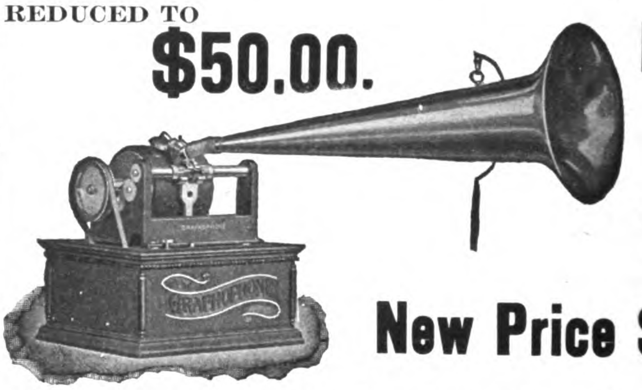

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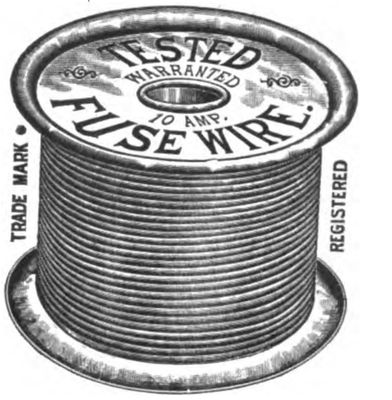

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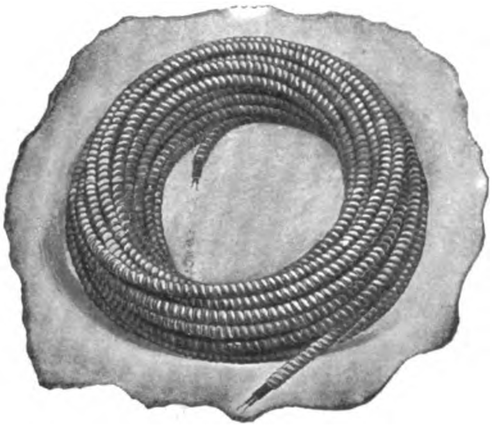

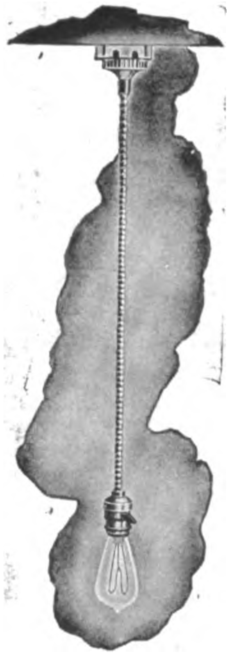

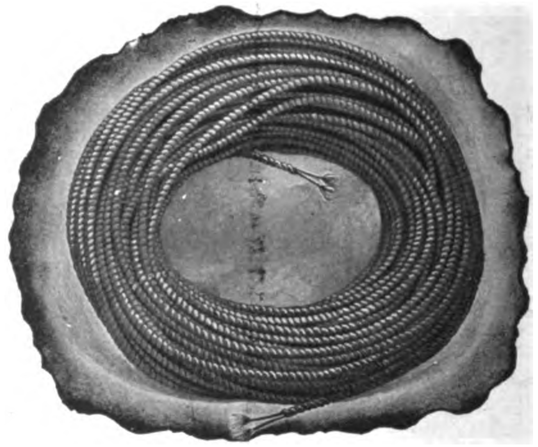

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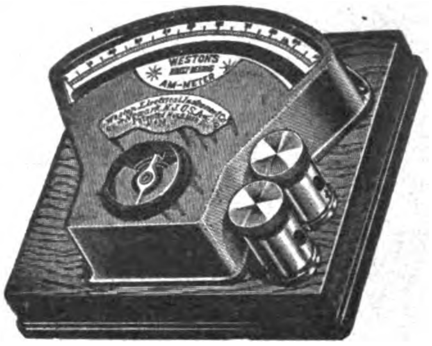

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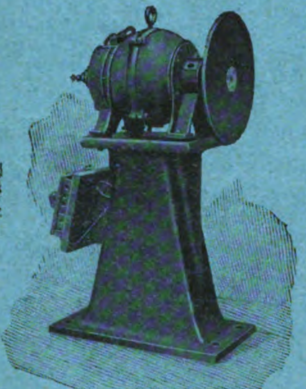

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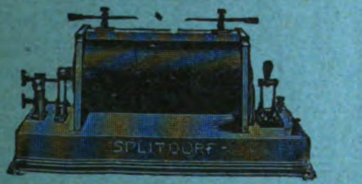

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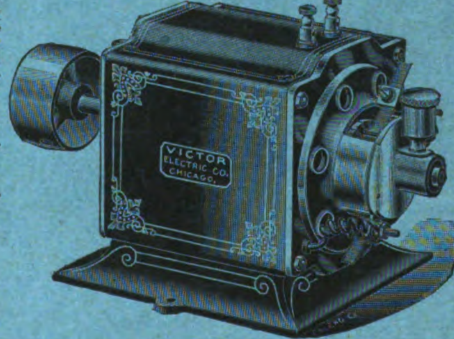

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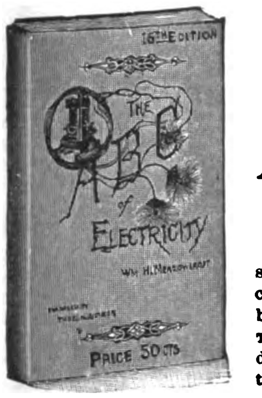

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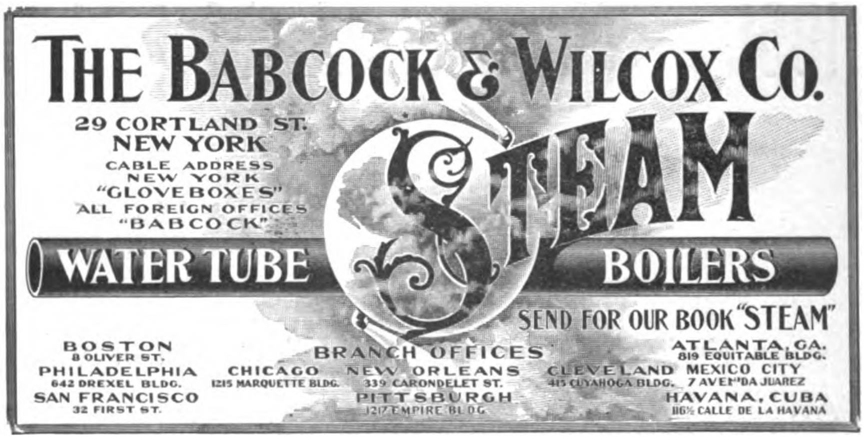

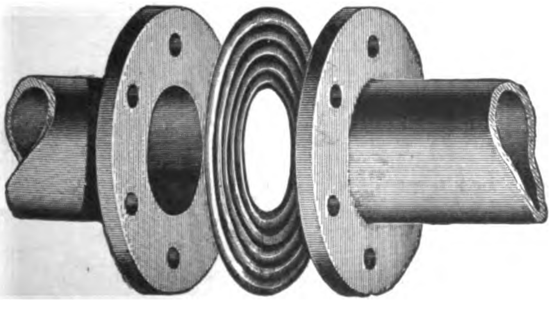

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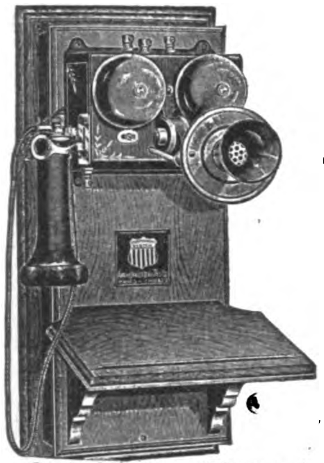

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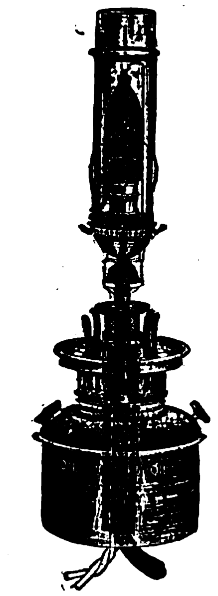

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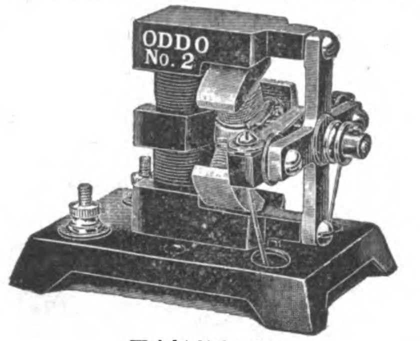

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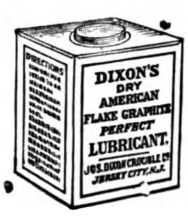

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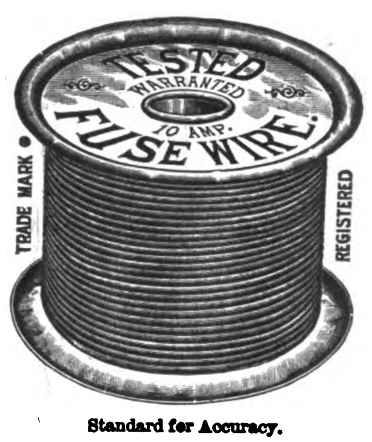

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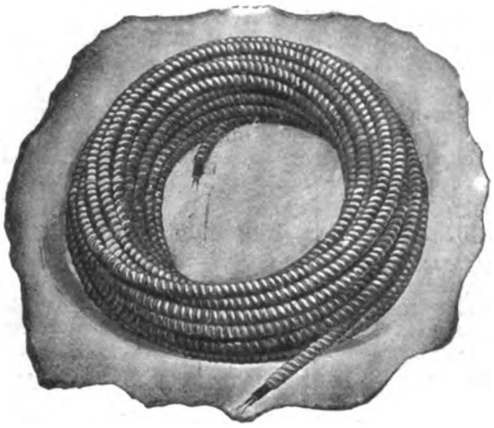

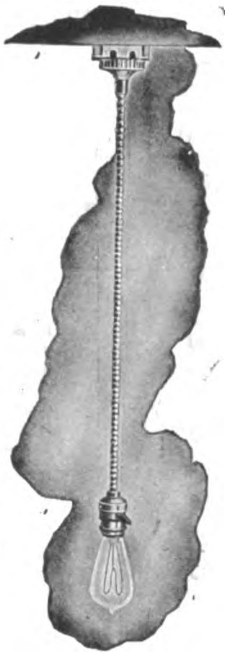

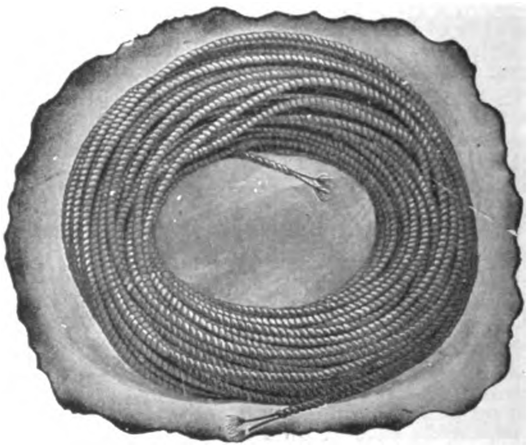

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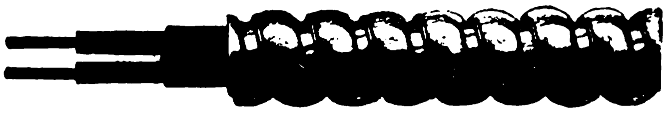

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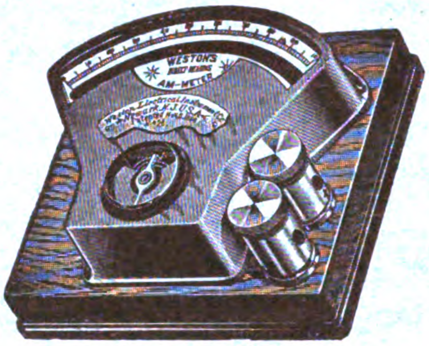

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